EXPRESS CERTIFICATE OF MAILING

Express Mail Certificate No. EV284867597US

I hereby certify that the *attached* correspondence comprising: 1).Supplemental Declaration of Eddie E. Scott of Prior Invention by Anthony J. Ruggiero to Overcome Cited Patent under 37 CFR §1.131 (17 pages) w/attachments (48 pages) is being deposited with the United States Postal Service "Express Mail Post Office to addressee" in an envelope addressed to: Mail Stop: Non-Fee Amendment, Commissioner for Patents, Alexandria, VA 22313-1450, on June 24, 2004.

Kathy Raymond

Kathy Raymond

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant :	Anthony J. Ruggiero	Docket No. :	IL-9928
Serial No. :	09/877,961	Art Unit :	1753
Filed :	06/08/2001	Examiner :	Kaj K. Olsen
For :	CHEMICAL MICRO-SENSOR		

SUPPLEMENTAL DECLARATION UNDER 37 CFR §1.131
(Portions Underlined are Supplemental)
Declaration of Eddie E. Scott of
Prior Invention by Anthony J. Ruggiero to Overcome Cited Patent

Commissioner of Patents and Trademarks
Alexandria, VA 22313-1450

Dear Sir:

I, Eddie E. Scott, hereby declare that:

(1) I am the attorney representing the inventor, Anthony J. Ruggiero, named in the subject application and the owner of the application, the University of California and I am the Declarant in the DECLARATION UNDER 37 CFR §1.131 filed December 22, 2003 in the subject application;

(2) I am a citizen of the United States and a resident of Danville, California;

(3) My education includes: Bachelor of Science Degree, University of Wyoming; Master of Science Degree, University of Texas at Dallas; Juris Doctor Degree, University of Wyoming; Patent Office Academy, Basic and Advanced, United States Patent and Trademark Office, Washington, D.C.;

(4) I am an active member of the State Bar of California, an inactive member of the State Bars of Texas and Wyoming, and I am registered to practice before the United States Patent and Trademark Office;

(5) I am employed by the University of California, at the Lawrence Livermore National Laboratory, Livermore, California, as Assistant Laboratory Counsel, having been employed by the University of California, at the Lawrence Livermore National Laboratory from May 1, 1999 to the present, and I am empowered to act on behalf of The Regents of the University of California, the owner of the subject application. <u>I was employed by the University of California, at the Lawrence Livermore National Laboratory, Livermore California, in the Industrial Partnership and Commercialization Office from May 1, 1999 until June 1, 2000, at which time I transferred to the Office of Laboratory Counsel where I have worked continuously from June 1, 2004 to the present</u>;

(6) The claims in the subject application were rejected over the primary reference, U.S. Patent No. 6,381,025 (Bornhop et al. Reference) and another secondary reference; the primary Bornhop et al. Reference issued April 30, 2002 from an application filed March 6, 2000 and was based upon a provisional application filed on August 19, 1999; therefore, August 19, 1999 is the earliest effective date of the Bornhop et al. Reference;

(7) I have obtained copies of certain documents (The Documents) maintained in the ordinary course of business of the University of California, the

Lawrence Livermore National Laboratory, and the United States Department of Energy (DOE) and I am one of the custodians of The Documents; copies of The Documents are attached hereto as Attachments A-AC, the Attachments A-AC have certain dates blacked out,

attached are new copies of Attachments A-AC and the dates have not been blacked out on the new copies of Attachments A-AC;

(8) The Documents included as exhibits to my declaration have the dates blacked out as provided for in MPEP § 715.07, however the dates appear in the new copies of the exhibits Attachments A-AC;

MPEP § 715.07 Facts and Documentary Evidence - ESTABLISHMENT OF DATES, provides, "If the dates of the exhibits have been removed or blocked off, the matter of dates can be taken care of in the body of the oath or declaration. When alleging that conception or a reduction to practice occurred prior to the effective date of the reference, the dates in the oath or declaration may be the actual dates or, if the applicant or patent owner does not desire to disclose his or her actual dates, he or she may merely allege that the acts referred to occurred prior to a specified date;"

I believe the procedure of blacking out the dates is desirable to protect the Applicant's rights because the actual dates may become important in later proceedings and it would be detrimental for me to disclose exactly how early are Tony J. Ruggiero's dates;

(9) The Documents show that The Inventor, Anthony J. Ruggiero, made the invention described and claimed in the subject patent application (hereinafter "The Invention") in this country prior to August 19, 1999; that Anthony J. Ruggiero conceived The Invention in this country on 7/10/93 which is prior to August 19, 1999; that Anthony J. Ruggiero made written descriptions of The Invention in this country prior to August 19, 1999; that Anthony J. Ruggiero

disclosed The Invention to others in this country prior to August 19, 1999; that Anthony J. Ruggiero reduced The Invention to practice in this country prior to August 19, 1999; and that Anthony J. Ruggiero continuously worked on testing, developing, and patenting The Invention during the period from the time when he made the first written description of The Invention and disclosed The Invention to others, <u>and specifically worked on testing, developing, and patenting The Invention from August 19, 1999, the earliest effective date of the Bornhop et al Reference</u> until 06/08/2001when the subject application was filed (hereinafter "The Time Period");

(10) The Inventor, Anthony J. Ruggiero, completed a "RECORD OF INVENTION," ATTACHMENT A is photostatic copy of the "RECORD OF INVENTION," the entries for the dates on ATTACHMENT A have been blacked out; however, <u>the dates appear in the new copy of ATTACHMENT A and</u> the dates are prior to August 19, 1999, <u>the stamped date in the upper left corner of page 1 shows that ATTCHMENT A was RECEIVED MAR 23, 1995 LLNL PATENT GROUP, the signatures and dates on page 3 by the inventor and witness are March 23, 1996;</u>

(11) The phototstatic copy of the "RECORD OF INVENTION" (ATTACHMENT A) includes includes three attachments and the entries for the dates on the three attachments have been blacked out; however, <u>the dates appear in the new copy of ATTACHMENT A's three attachments, and</u> the dates are prior to August 19, 1999, <u>the date on page 1 of the attachment titled "Advanced Concepts Program" is June 27, 1995 and the dates on the attachment titled "INTEGRATED OPTIC CAPILLARY ELECTROPHORESIS MICOSENSOR" ARE BETWEEN 1996 AND 1999;</u>

(12) The photostatic copy of the "RECORD OF INVENTION" ATTACHMENT A, in the Conception Date Place, Section X, contains an entry for

the "Conception Date," the entry has been blacked out; however, <u>the date appears in the new copy of ATTACHMENT A and is 7/10/93 and therefore</u> the entry is prior to August 19, 1999 and the "Conception Place" entry LLNL is in this country (USA);

(13) The photostatic copy of the "RECORD OF INVENTION" (ATTACHMENT A) also includes sections showing that Anthony J. Ruggiero made The Invention in this country prior to August 19, 1999, that Anthony J. Ruggiero made written descriptions of The Invention in this country prior to August 19, 1999, that Anthony J. Ruggiero disclosed The Invention to others in this country prior to August 19, 1999, that Anthony J. Ruggiero reduced The Invention to practice in this country prior to August 19, 1999, and that testing, developing, and patenting of The Invention was continuously worked on during The Time Period;

(14) The Invention was tested prior to August 19, 1999 and The Invention was reduced to practice in this country prior to August 19, 1999, the "RECORD OF INVENTION" (ATTACHMENT A) includes section XI. Reduction to Practice with entries for Date first model completed and Date of operation and testing, the entries have been blacked out; however, <u>the dates appear in the new copy of ATTACHMENT A as Date first model completed: July 1994 and Date of operation and testing July 1994 therefore</u> the entries are prior to August 19, 1999, the results of testing of The Invention were prior to August 19, 1999 and The Invention was to reduced to practice in this country prior to August 19, 1999; the dates on the photostatic copies have been blacked out, however, <u>all the dates appear in the new copy of ATTACHMENT A and</u> the dates are prior to August 19, 1999;

<u>ATTACHMENT A consists of three (3) parts, the first part is a competed Record of Invention (ROI) form and the second and third parts are documents</u>

attached to the ROI, the directions for the inventor to use in completing the ROI are the following:

Forms:
Submit Record Of Invention (ROI) Form if applicable.
«Download PDF version of the ROI form (E-Form LL6419)

- Contact the LLNL Intellectual Property Law Group at 2-7272 with questions
- Different file formats of the form can be obtained from the LLNL Electronics Forms Library at http://www-r.llnl.gov/eforms/eforms_lib.html#6400

Title:
Be brief - one line - succinct and to the point. The title should provide just enough information to identify the Invention without giving details so we can use the title freely.
Inventors:
Include all those and only those whose contributions are necessary. This may include inventors from outside LLNL (they are listed separately on the form). If the Invention is licensed, all inventors share equally in royalty distribution unless all agree in writing to a different distribution.
Abstract of the Invention:
Need one or two paragraphs; keep to the point.
Uses of the Invention:

- Government Use - permits assessment of the need to establish defenses
- Commercial Use - needed to help gauge and define markets, to formulate licensing strategy, and to establish Fields of Use (all this information is important for licensing)

Documents Describing Prior Art:
Disclosure publications by others that relate to the inventions:

- To cite to the US Patent Office
- To assess the scope of the invention and help in claim drafting

Background of the Invention:
The write-up should discuss:

- The State of the Art
- Problems that the invention solves
- Improvements over existing technologies
- Surprising results of discoveries
- Dramatic changes

Detailed Description of the Invention:

- Keep it brief - one to a few pages
- Provide drawings or sketches to help understand the Invention

- Append materials already written (papers, journal articles, etc.)
- Be specific - it helps us understand and formulate searches
- Indicate the breadth of the Invention

Inventor Information:

- Patent applications are filed in the name of the inventor(s)
- Assignees and the Patent Office need to be able to communicate with the inventors
- Patent applications are not public; issued patents cite the inventor's residence location

Funding Source Information:

- Provide the account number of the work that led to the invention
- Account numbers determine which Directorates receive shares of revenues
- B&R codes tell DOE if and how rights are transferred to UC
- CRADA and WFO information is used to determine the rights of private sponsors

Conception of the Invention:

- Conception is when the Invention has been mentally formulated
- Need date when this took place
- Documentation is when conception was first recorded
- Must be corroborated by witnesses who understand the Invention and can testify, if necessary

Reduction to Practice:

- Date when Invention was first built, operated, and tested
- Need witnesses to corroborate
- Good idea to keep notebooks
- May need evidence to show we invented before
    - Another who claims to have made the same Invention, or
    - A publication describing the invention before our application was filed (< 1 year)

Signatures:

- Inventor(s) sign and date

Witness also needs to sign - Signature witness does not need to understand the Invention, only

ADC Review

Authorized Derivative Classifiers (ADCs) are required to review the document to satisfy Classification Office requirements.

(15) During The Time Period the Industrial Partnership and Commercialization Office (IPAC) of the Lawrence Livermore National Laboratory held monthly Invention Review Meetings and The Invention was reviewed at the Invention Review Meetings during The Time Period; IPAC continuously reviews inventions and prioritizes inventions for patent application filing; The Invention was reviewed and prioritized by IPAC during The Time Period; photostatic copies of a database entries showing that The Invention was reviewed by IPAC during The Time Period are attached as Attachments B, C, and D;

<u>the dates on the photostatic copy of ATTACHMENT B have been blacked out, however, all the dates appear in the new copy of ATTACHMENT B as "High 20 Date: June 1999," "Selected by IPAC for Top 20 (Weis/Dunipace) 6/23/99," and "Added to Top 20 List July 7, 1999";</u>

<u>the dates on the photostatic copy of ATTACHMENT C have been blacked out, however, all the dates appear in the new copy of ATTACHMENT C and specifically the following dates appear in the new copy of ATTACHMENT C: "Rights Requested 5/25/1999," "Rights Granted 9/7/2000," and "Priority List 7/7/99";</u>

<u>the dates on the photostatic copy of ATTACHMENT D have been blacked out, however, all the dates appear in the new copy of ATTACHMENT D and specifically the following dates appear in the new copy of ATTACHMENT D: "Disclosure Submitted 4/9/1996";</u>

(16) During The Time Period the Office of Laboratory Counsel (OLC) of the Lawrence Livermore National Laboratory, held monthly Invention Review Meetings and The Invention was reviewed at the Meetings during The Time Period; the Office of Laboratory Counsel (OLC) also held monthly meetings with the Industrial Partnership and Commercialization Office (IPAC) during The

Time Period and The Invention was reviewed at the Meetings; OLC prepares patent applications for filing according to a priority list; the parent application of the subject application was prepared by OLC covering The Invention according to the priority list; photostatic copies of a database entries showing that The Invention was reviewed and a patent application filed by OLC during The Time Period are attached as Attachments E, F, G, H, I, J, and K;

the dates on the photostatic copy of ATTACHMENT E have been blacked out, however, all the dates appear in the new copy of ATTACHMENT E and specifically the following dates appear in the new copy of ATTACHMENT E: "Attorney Scott - Date Attorney Assigned 6/1/2000," "Disclosure Submitted 4/9/1996," "Application Authorized 5/25/1999," "Rights Requested 5/25/1999" and "Rights Granted 9/7/2000";

the dates on the photostatic copy of ATTACHMENT F have been blacked out, however, all the dates appear in the new copy of ATTACHMENT F and specifically the following dates appear in the new copy of ATTACHMENT F: "Application Authorized 5/25/1999," "Application Mailed 6/8/2001," "Disclosure Submitted 4/9/1996," "Rights Granted Date 9/7/2000"; "High 20 Nominated Candidate 6/23/99," and "High 20's List 7/7/1999";

the dates on the photostatic copy of ATTACHMENT G have been blacked out, however, all the dates appear in the new copy of ATTACHMENT G and specifically the following dates appear in the new copy of ATTACHMENT G: "Disclosure Submitted 4/9/1996," "Application Authorized 5/25/1999," and "High 20's List 7/7/1999";

the dates on the photostatic copy of ATTACHMENT H have been blacked out, however, all the dates appear in the new copy of ATTACHMENT H and specifically the following dates appear in the new copy of ATTACHMENT H: "Disclosure Submitted 4/9/1996" and "Application Authorized 5/25/1999";

the dates on the photostatic copy of ATTACHMENT I have been blacked out, however, all the dates appear in the new copy of ATTACHMENT I and specifically the following dates appear in the new copy of ATTACHMENT I: "Patent Priority List 7/7/1999" and "Authorized 5/25/1999";

the dates on the photostatic copy of ATTACHMENT J have been blacked out, however, all the dates appear in the new copy of ATTACHMENT J and specifically the following dates appear in the new copy of ATTACHMENT J: "Disclosure Date 4/9/1996" and "Patent Filing Date 6/8/2001";

the dates on the photostatic copy of ATTACHMENT K have been blacked out, however, all the dates appear in the new copy of ATTACHMENT K and specifically the following dates appear in the new copy of ATTACHMENT K: "Added to List 7/7/1999";

(17) During The Time Period The Invention was continuously worked on; photostatic copies of documents maintained in the ordinary course of business of the University of California, the Lawrence Livermore National Laboratory, and the United States Department of Energy (DOE) showing that The Invention was continuously worked on during The Time Period are attached as Attachments L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, AA, AB, and AC;

the dates on the photostatic copies of ATTACHMENTS L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, AA, AB, and AC have been blacked out, however, all the dates appear in the new copies of ATTACHMENTS L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, AA, AB, and AC and specifically the dates of the documents are as shown in the following table:

Attachment	DATE
L	April 10, 1996
M	Apr 19, 1996
N	July 23, 1996

O	July 23, 1996
P	July 23, 1996
Q	Apr 19, 1996
R	May 25, 1999
S	May 25, 1999
T	Jul 15, 1999
U	Sep 07, 2000
V	May 25, 1999
W	4/10/01
X	5/22/01
Y	Jun 04, 2001
Z	April 11, 2000
AA	June 4, 2001
AB	June 8, 2001
AC	June 8, 2001

I met with the inventor, Anthony J. Ruggiero, during the preparation of the patent application and sent drafts of the patent application to the inventor, Anthony J. Ruggiero, for his review and comment;

Because of the complexity of the invention I ask for and received assistance from another patent attorney, Ann Lee, and another scientist, Gary Johnson; I met with Ann Lee and Gary Johnson and discussed drafts of the patent application and sent drafts of the patent application to Ann Lee and Gary Johnson for their input; I met with a patent draftsman, Don Lambert, and discussed the preparation of the patent drawings and provided a copy of a draft of the patent application to the patent draftsman, Don Lambert;

the Office of Laboratory Counsel (OLC) prepared patent applications for filing according to a priority list during The Time Period, the parent application

of the subject application was prepared by OLC covering The Invention according to the priority list during The Time Period, a photostatic copy of the OLC "Monthly Report Worksheet – August 1999" is attached as ATTACHMENT S-1, showing that the file for the subject application "9928," was one of 174 Patent Applications requested by IPAC and that the subject invention "9928" was assigned to the Manager of the Patent Group – John Wooldridge,

on page 3 of ATTACHMENT S-1, the subject invention "9928" is listed in numerical order as one of the 174 Patent Applications requested by IPAC,

on page 17 of ATTACHMENT S-1, the subject invention "9928" is listed in as one of the inventions assigned to the Manager of the Patent Group – John Wooldridge,

a photostatic copy of page 19 of the OLC "Monthly Report Worksheet – October 1, 1999 to October 31, 1999" is attached as ATTACHMENT S-3, showing that the subject invention "9928" remained assigned to the Manager of the Patent Group – John Wooldridge,

a photostatic copy of page 20 of the OLC "Monthly Report Worksheet – November 1999" is attached as ATTACHMENT S-4, showing that the subject invention "9928" remained assigned to the Manager of the Patent Group – John Wooldridge,

a photostatic copy of page 21 of the OLC "Monthly Report Worksheet – December 1999" is attached as ATTACHMENT S-5, showing that the subject invention "9928" remained assigned to the Manager of the Patent Group – John Wooldridge,

a photostatic copy of page 13 of the OLC "Monthly Report Worksheet – January 2000" is attached as ATTACHMENT S-6, showing that the subject invention "9928" remained assigned to the Manager of the Patent Group – John Wooldridge,

a photostatic copy of page 15 of the OLC "Monthly Report Worksheet – February 2000" is attached as ATTACHMENT S-7, showing that the subject invention "9928" remained assigned to the Manager of the Patent Group – John Wooldridge,

a photostatic copy of page 13 of the OLC "Monthly Report Worksheet – March 2000" is attached as ATTACHMENT S-8, showing that the subject invention "9928" remained assigned to the Manager of the Patent Group – John Wooldridge,

a photostatic copy of page 12 of the OLC "Monthly Report Worksheet – April 2000" is attached as ATTACHMENT S-9, showing that the subject invention "9928" remained assigned to the Manager of the Patent Group – John Wooldridge,

the OLC experience significant Patent Attorney staff problems during the years 1999 and 2000 and as a result of the OLC Patent Attorney staff problems the subject invention "9928" remained part of a back log of inventions wherein patent applications had been requested by IPAC but applications had not been started,

in 1999 the OLC Patent Attorney staff consisted of four Patent Attorneys (John Wooldridge, Daryl Grzybicki, Lloyd Dakin, and Alan Thompson), one Patent Attorney (Bud Carhahan) worked as a contract attorney but was not part of the Patent Attorney staff,

during 1999 one of the four patent attorneys, (Lloyd Dakin) resigned, (Resigned December 2, 1999),

during 1999 one of the four Patent Attorneys, Daryl Grzybicki, died (Died December 15, 1999),

on March 1, 2000 the manager of the OLC Patent Attorney Staff, John

Wooldridge, resigned, which left only one staff Patent Attorney (Alan Thompson),

I worked in the Industrial Partnership and Commercialization Office (IPAC) from May 1, 1999 until June 1, 2000, at which time I transferred to the Office of Laboratory Counsel (OLC) which increased the Patent Attorney Staff to two, shortly thereafter Ann Lee joined the Patent Attorney staff,

the first six inventions that were assigned to me to prepare patent applications included the subject invention "9928,"

a photostatic copy of page 10 of the OLC "Monthly Report Worksheet – For the Period May 1, 2000 to May 31, 2000" is attached as ATTACHMENT S-10, showing that the subject invention "9928" was assigned to me during the period May 1, 2000 to May 31, 2000, the May 2000 Monthly Report ATTACHMENT S-10 shows that the subject invention "9928" was assigned to me when I started June 1, 2000,

photostatic copies of my calendars from June 2000 through June 2001 are attached as ATTACHMENT S-11, the subject invention "9928" was an invention made by a scientist at the Nonproliferation, Arms Control, and International Security (NAI) Directorate, Dr. Anthony J. Ruggiero, on Tuesday June 6, 2000 I attended the IPAC Patent Reviews and I attended the NAI Patent Review at 10:00AM, on Wednesday June 7, 2000 at 1:30 PM I met with the inventor of the subject invention "9928" to start the preparation of a patent application covering the subject invention "9928, and on June 27, 2000 at 10:30 AM I attended the Patent Priority Meeting,"

the mission of the Nonproliferation, Arms Control, and International Security (NAI) Directorate is to provide technology, analysis, and expertise to aid the United States government in preventing the spread or use of weapons of mass destruction, the inventor of the subject invention "9928," Dr. Anthony J.

Ruggiero, is an important and very busy scientist at NAI, and while he was cooperative and helpful in explaining the invention and preparing drafts of the patent application, it was difficult for me as newly within the Office of Laboratory Counsel staff to prepare the final patent application and I prepared many drafts of the patent application and consulted with numerous others in preparing the patent application,

on Tuesday July 11, 2000 I attended the IPAC Patent Reviews and I attended the NAI Patent Review at 9:15AM and on July 25, 2000 at 10:30 AM I attended the Patent Priority Meeting,"

on August 22, 2000 at 10:30 AM I attended the Patent Priority Meeting and at 3:00 PM I met with Annemarie Meike, the NAI representative from IPAC regarding preparing the patent application for the subject invention 9928,

on September 26, 2000 at 10:30 AM I attended the Patent Priority Meeting,

on Wednesday October 4, 2000 at 2:30 PM I met with the inventor of the subject invention "9928" Dr. Anthony J. Ruggiero, to review a draft of the patent application and to obtain help with the preparation of the patent application covering the subject invention "9928, and on October 24, 2000 at 10:30 AM I attended the Patent Priority Meeting,"

on Friday November 17, 2000 at 1:30 PM I met with the inventor of the subject invention "9928" Dr. Anthony J. Ruggiero, to review another draft of the patent application and to obtain additional help with the preparation of the patent application covering the subject invention "9928, and on November 28, 2000 at 10:30 AM I attended the Patent Priority Meeting,"

on Thursday January 25, 2001 at 2:00 PM I attended the Patent Priority Meeting,

on Thursday February 27, 2001 at 10:30 AM I attended the Patent Priority Meeting,

on Thursday March 27, 2001 at 10:30 AM I attended the Patent Priority Meeting,

on Wednesday April 11, 2001 at 2:00 PM I met with the inventor of the subject invention "9928" Dr. Anthony J. Ruggiero and another scientist Gary Johnson, to review another draft of the patent application and to obtain additional help with the preparation of the patent application covering the subject invention "9928, and on April 24, 2001 at 10:30 AM I attended the Patent Priority Meeting,"

on Thursday May 29, 2001 at 10:30 AM I attended the Patent Priority Meeting,

on Friday June 8, 2001 I filed the subject patent application,

during the period from June 1, 2000 until June 8, 2001 that the subject invention "9928" was assigned to me to prepare and file a patent application, I continuously worked on preparing drafts of the patent application, meeting with the inventor and other individuals to learn more about the invention and to revise drafts of the patent application, among the other individuals were patent attorney, Ann Lee and scientist, Gary Johnson,

(18) I do not know and do not believe that the invention has been in public use or on sale in this country, or patented or described in a printed publication in this or any foreign country for more than one year prior to the application, and I believe the inventor has never abandoned his invention;

(19) I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States

Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

(Signature) ____________________
Declarant: Eddie E. Scott

Dated: June 24, 2004
Livermore, California

Disclosures Sent to DOE:

10552 CR	Other	(Knapp) Sphere Implosion Initiation Device
10560	Engineering	(Mariella) Building Airspace Protection System
10567	Engineering	(Funkhouser) Enhanced Safety Load-bearing Kinematic Mount Design
10570	Engineering	(Williams) Ball Mill Axial Discharge Apparatus
10571	Lasers	(Beach) Tapered Laser Rods as a Means of Minimizing the Path Length of Trapped Barrel Mode Rays
10574	Engineering	(McNab) In Situ Treatment of Contaminated Groundwater by Catalytic Reductive Dehalogenation Facilitated by Water Electrolysis with an Electrode Array
10575	C&MS	(Tillotson) Metal Oxide Energetic Material Synthesis using Sol-Gel Chemistry
10576	Engineering	(Krulevitch) Handheld Personal Computer Capable of Real Time Data Entry
10577	Engineering	(Stever) High Speed Radar (HSR): An Apparatus for Transmitting and Receiving Ultra-wideband Electromagnetic Pulses used for High-speed Interrogation of Targets Moving at a High Velocity Relative to the Radar
10578	Other	(Lowe) GDP-L-Fucose: β-D-Galactoside 2-α-L-Fucosyltransferases, DNA Sequences Encoding the Same, Method for Producing the Same and a Method of Genotyping a Person
10579	C&MS	(Fox) Dendritic Methodology Applied to the Prediction, Design and Synthesis of Low Density Materials
10580	Engineering	(Krulevitch) Microfabricated Instrument for Tissue Biopsy and Genetic Analysis
10581	Engineering	(Krulevitch) Method for Producing Microchannels having Circular Cross-sections in Glass
10582	Engineering	(Benett) Convectively Driven PCR Thermal-Cycling
10583	Other	(Gibbons) Thin Film Read head Structure with Improved Bias Magnet-to-Magnetoresistive Element Interface and Method of Fabrication

Disclosures Pending Submittal:

10411-CR	Lasers	(Hale) Projection Optics Box
10460	C&MS	(Stevens) Low Friction Materials for Use at Cryogenic Temperatures
10469	OTHER??	(Arsdall) CORBA-Based Simulator Integrated Computer

Applications Authorized by IP&C

8480	Lasers	(Solarz) A Microchannel Cooled Edge Cladding to Establish an Adiabatic Boundary Condition in a Slab Laser
8936	Lasers	(Manes) Lensless Projection Lithography
9396	C&MS	(Hrubesh) Lightweight Gradient-Index Lenses
9449	EE	(Thomas) High Voltage Clamp for Application to Time-of-Flight, Mass Spectrometer...
9466	EE	(Yee) Modulated Doping
9522	Lasers	(Ebbers) Compact Compensated Q-Switch
9530	Physics	(Bonde) Etch-Plate-Sputter-Etch Technique to Fabricate Gated Microfilaments
9598	ME	(Thelin) Water Soluble Crystal Polishing Using Aluminum Oxide and Formamide GR
9626	C&MS	(Reynolds) Process for Removing Metals from Crude Oils
9639	Physics	(Kare) High-Radiance Non-Coherent Light Source
9640	Lasers	(McEwan) Precision Wideband Radar Rangefinder
9682	Lasers	(McEwan) Magneto-Radar Hidden Metal Detector
9725	Lasers	(McEwan) Headset Mounted Microradar Throat Microphone
9726	Lasers	(McEwan) Microradar Voice Alteration Device
9728	Lasers	(McEwan) Rangefinder with FCC Complaint Spectrum
9751	C&MS	(Hsu) Recovery of Silver from Waste Silver Chloride
9753	C&MS	(Zundelevich) Oxidation of Nitrous to Nitric Acid in Self-Aerated Gas-Liquid Contractors
9769	ME	(Beckwith) An Electronic Means for Cancellation of Periodic Error in Heterodyne Interferometry
9773	Lasers	(Vann) Plasma Electrode Semiconductor Laser
9800	EE	(Portnoff) Radar Assisted Time-Scale Modification of Speech
9816	EE	(Thomas) Collimator Application for Resolution Improvement of Microchannel Plate Image...
9817	EE	(Baker) Solid State Infrared Camera
9819	PE (Other)	(Morrow) Sonar Pipe Assessment Probe
9832	Lasers	(Toeppen) Laser Rangefinder Coaxial Optics
9840	EE	(Sampayan) Large Area Diamond Photocathode System
9841	Lasers	(McEwan) Improved-Ultra-Wideband Receiver
9858	Physics	(Erskine) Achromatic Superimposing Delay Designs

9862	Physics	(Bonde) Patterning Flat Panel Display Aerogel Spacers by Physical Abrasion
9863	Weapons	(Seppala) A Molded Acrylic Nested Lens for Efficient Illumination and Light Collection...
9865	Lasers	(McEwan) High Strobe Rejection Ultra-Wideband Receiver
9866	EE	(Portnoff) Efficient Method for In-Situ Matrix Transpose
9870	Lasers	(Skidmore) Low-Cost Monolithic Laser Diode Array
9875	C&MS	(Cooper) Large-Area Decontamination Using Peroxydisulfate with UV and Metal-Ion Catalysis
9893	C&MS	(Hrubesh) Ultra-Lightweight Diaphragms from Laminated Aerogel
9908	Lasers	(Trebes) X-Ray Source for Use on an Intravascular Catheter
9909	Lasers	(Meyers) Electron Beam Current Monitor Using Oxidized or Nitrided Silicon
9910	EE	(Sampayan) High Power Discharge Closing Switch
9916	Env. Sci.	(Yow) Method for Increasing Soil Permeability and Heating Soil in situ for Thermally Enhanced Site Remediation
9917	Lasers	(Trebes) Acoustic Detection of Vascular Defects within the Head
9918	Lasers	(Trebes) Intravascular X-Ray Catheter Radiation Monitor
9925	Physics	(Bonde) Patterning Flat Panel Display Porous Material Spacers by Physical Abrasion
9928	NAI	(Ruggiero) Integrated Optical Capillary Electrophoresis Chemical Microsensor
9931	Other	(Hunter) Gaseous Fuel Supply for Lighter than Air Vehicles
9932	ME	(Barksdale) Zero Input End Spoiled Microchannel Plate
9943	ME	(Biltoft) Micro Wheatstone Bridge Circuit for Analytical Instrument Applications
9956	EE	(Conder) Vertically Phased MOS Electrode Structures for Change Storage in Semiconductors
9957	C&MS	(Fox) Increased Solubility of Elctro-Luminescent Polymers Via Addition of Radical Initiators
9959	C&MS	(Stevens) Optical Pumping for Remote Chemical Sensing
9965	Lasers	(Beach) Laser Roads with Undoped, Flanged End-Caps for End-Pumped Laser Applications
9977	C&MS	(Stevens) Signal Processing by Minimization of Residual Complexity

9979	MFE	(Post) Improved Passive Stabilizer for Rotor-Dynamic Instabilities
9980	Physics	(Bernhardt) Electron Injecting Electrode for Organic Electroluminescent Displays
9985	EE	(Yu) High Temperature Sample Injector
9990	C&MS	(Zundelevich) Two-Stage Acidic Urea DeNOx Process in Self-Aerated Gas-Liquid Contactors
9994	Lasers	(Freitas) Layered Laser Diode Array
9997	Lasers	(Cartland) Stagnation Pressure Activated Fuel Release Mechanism for Hypersonic Projectiles
10001	C&MS	(Coburn) Electrochemical Production of Nitromethane from Acetic Acid
10004	C&MS	(Watkins) A Top Injection System for Processing Explosives
10010	Physics	(van Bibber) An Energy-Loss Camera for Proton Radiography Based on Near-Threshold ...
10012	Physics	(Bennett) Phase Chirped Imaging Fourier Transform Spectrometer
10017	EE	(Wilhemsen) Hazard Avoidance Limiter for Telerobotics
10022	ME	(Logan) High-Resolution Detector for Digital Imaging with High-Energy X-Rays
10023	Lasers	(Vann) Tiered Diode Array
10034	Lasers	(Colston) Optical Coherence System for Measuring Ice Buildup on Airplane Surfaces
10037	Lasers	(Freitas) Ruggedized, Microchannel-Cooled Laser Diode Array
10043	C&MS	(Fox) Functionalization of Soluble Polymers by Covalent Attachment of Luminescent and Electroluminescent Molecular Units
10045	EE	(Leach) Process for Automatic Indication of Need for Natural Gas Storage Well Remediation
10047	BBRP	(Ophoff) Mutations in CACNL 1A4 Associated with Familial Hemiplegic Migraine...
10050	C&MS	(Upadhye) A General Purpose Molten Salt Destruction Equipment
10052	Physics	(Erskine) Probabilistic Encryption by Scrambled Partial Coherence of Noise
10057	C&MS	(Glass) Sensor-Based System for Minimization of Neurological Damage Resulting from Stroke or Other Brain Trauma
10063	Physics	(Roeske) Fast, A1-Coated PIN Diagnostic
10072	Physics	(Netel) High-Resolution X-Ray and Y-Ray Spectrometer Based on High-Z, Ultra-Pure...
10074	EE	(Mullenhoff) Tongue Antenna

10075	C&MS	(Reynolds) Method of Separating Olefins from Mixed Hydrocarbon and Refinery Gas Streams Using Metal Nitrides
10079	Lasers	(Freitas) High-Brightness, High Power, Quasi-Monolithic Diode Array
10081	Lasers	(Burnett) Noise Reduction Em Sensor and Acoustic Algorithms
10082	Lasers	(Burnett) New EM Sensor/Acoustic Electronic and Numerical Algorithms
10086	Physics	(Bernhardt) Process for Fabrication of a Microrelay
10094	Physics	(Erskine) Solid-Angle Independent High Resolution Spectrometer
10096	Lasers	(Shafer) Mirror Systems for EUV
10101	Lasers	(Stone) Vacuum Sealing Technique for an X-Ray Microtube
10104	C&MS	(Tillotson) Method for Preparing Transparent Alumina Aerogels...
10105	C&MS	(Hrubesh) Vanadia-Silica Aerogel Fast Sensing Detector-Desiccant
10106	Physics	(Erskine)Wavelength Resolving Coherence Multiplexing for High Speed Fiber Optic Communication
10107	Physics	(Erskine) Two-Delay Interferometer and Application to Spectrometry
10108	Physics	(Erskine) Prejudicial Presentation of Sources to Anticipate Fiber-Optic Dispersion
10109	EE	(Yu) Low Porosity Silicon Nitride Films
10114	Lasers	(Darrow) A Passive Device for Indication of Rotational Orientation of Medical Device...
10116	C&MS	(Pagoria) High Performance Explosive Molecules
10119	EE	(Kallman) Mechanoluminescent Acoustic Field Sensor
10135	Physics	(Erskine) Retarding Superimposing Interferometer Configurations
10136	Lasers	(Vann) Laser Shadow Sensor for Measuring Fluid Level in an Open Vessel
10149	Env. Sci.	(Vogel) Device and Method for Single-Use Container-Controller-Ionizer for Gas Samples
10150	Lasers	(Estabrook) Improved Spatial Filter for High Power Lasers
10161	Lasers	(Vann) Parallel Optical Signal Transmission and Reception System
10163	Env Sci	(Molitoris) Cross-Cavity Reinjection for Laser Heterodyne Amplification
10168	Physics	(Erskine) Delay-Free Differential Interferometric Spectrometer

10172	EE	(Swierkowski) Dual Flow F Load for Microcapillary Fluidic Injection Systems
10177	Lasers	(Toeppen) Holographic Recording and Inspection of Optical Systems
10180	C&MS	(Fox) Thio-, Amine, Nitro and Macrocyclic Containing Organic Aerogels
10182	Physics	(Koo) Measurement of Water Content by Pico-Second Electromagnetic Pulse Technology
10183	Lasers	(Everett) Method for Marking or Etching of Images into a Metal Surface Using a Laser
10185	ME	(Hale) Differential Friction Drive for Precision Rotary Applications
10188	EE	(Miles) A Hydraulically Amplified PZT MEMS Actuator
10189	EE	(Miles) A Fluidic System Based on Monolithic Tubes and Plenums
10202	Lasers	(Fernandez) Method for Optimizing Multiple-Beam Interference Patterns for Lithography
10203	P&ST	(Marrs) An X-Ray Microscope Powered By Highly Charged Ions
10204	Physics	(Cox) Dynamic Monte Carlo Optimization of Intensity Modulated Radiotherapy
10207	Lasers	(Da Silva) Tapered Fiber Optics via Multiple Heat Shrink Wrapping for Endovascular Steerability
10220	C&MS	(Coronado) Rapid Process For Producing Transparent, Monolithic Porous Glass
10222	Lasers	(Spallas) A Tunnel Junction Spin-Valve Transistor
10224	Lasers	(Carey) Read/Write Head Having a GMR Sensor Biased by Permanent Magnets Located Between the GMR and the Pole Shields
10229	C&MS	(Coronado) Method for Preparing Precursors for Producing Monolithic Metal Oxide Aerogel with Densities Between 0.3g/cc to 1.5g/cc
10235	JPO-100-Engineerin g-0	(Haddad) Endoscope Optical Isolation
10237	Lasers	(Freitas) Low-Cost, High-Registration, Monolithic Laser Diode Array with Removal Spring
10239	Lasers	(Page) All-Solid-State Tunable Visible Laser Source Using Sum-Frequency-Mixing or Frequency Doubling of a Yb:Silica Fiber Laser and a n Nd:YAG Laser
10280 CR	Energy	(Folta) High-Speed, Low-Power Thermopneumatic Microfabricated Actuator using the Insulated-Piston Approach

10308	Energy	(Post) Improved Version of High-Power Halbach-Array Generator/Motor
10312	BBRP	(Olsen) Nephrin Gene and Protein
10318	Lasers	(Haddad) Method for Transmission-mode Ultrasonic Tomography
10319	Lasers	(Haddad) Method for Reflection-mode Ultrasonic Tomography
10320	ENG	(Wieskamp) Compact Asymmetric Blumlein Flash X-Ray Source
10321	ENG	(Thomas) Ultrasonic Breast Imaging System
10322	ENG	(Candy) Compensated, Individually Addressable Array Technology
10323	ENG	(Candy) Dynamic Focusing of Ultrasound for Mass Removal in Tissue
10330	ENG	(Miles) Hydrodynamic Enhanced Dielectrophoretic Particle Trapping
10331	ENG	(Miles) Movement of Particles using Sequentially Activated Dielectrophoretic Particle Trapping
10333	NAI	(Madden) Actively Driven Thermal Radiation Shield for a Mechanically Cooled Portable Germanium Gamma-Ray Spectrometer
10334	Lasers	(Bajt) A Technique to Quantitatively Measure Magnetic Properties of Thin Structures at <10 nm Spatial Resolution
10335	JPO-100-Engineering-0	(Makarewicz) Laser and Acoustic Lens for Lithotripsy
10342	JPO/D&NT/Lasers	(Bearinger) Injectable Sensor
10346	D&NT	(McCarthy) An Etch Sequence for Thin and Smooth Silicon Wafers
10352	D&NT	(Frank) Laser Initiated Detonator with Rotated Detonation Output
10357	Engineering	(Carr) Atmospheric Pressure Reactive Atom Plasma Processing for Shaping of Damage Free Surfaces
10359	Lasers	(Perry) Laser Radiography
10363	NAI	(Seward) Shape Memory Bimorph Microvalve Actuator Created from Ti-Ni Sheet
10364	NAI	(Yu) A Thin Film Capillary
10365	Energy	(Koo) Paper Area Density Measurement from Forward Transmitted Scattered Light
10367	D&NT	(Kirbie) Compact Pulsed Power Source
10368	D&NT	(Caporaso) Improved Compact Accelerator
10369	D&NT	(Sampayan) Compact Pulsed Lithography System
10370	Lasers	(Colston) Hand-held Dental Imaging Device

10373	Engineering	(Miles) Stepped Electrophoresis for Movement and Concentration of DNA
10374	Engineering	(Krulevitch) Applications of Dielectrophoresis to DNA Sample Preparation
10380	C&MS/NAI	(Andresen) Porous Protective SPME Sheath
10385	EUVL	(Sweatt) Condenser Design for Extreme-UV Ring Field Lithography Camera
10387	P&ST	(Wolfe) Reflective Coating for Radiation Protection during Processing
10390	BBRP	(McCready) A Novel Dye Terminator Protocol for DNA Sequencing
10392	C&MS or Environmental	(Farmer) Electrolytic Cells with Fluidized-bed, Moving-bed, Slurry, and Moving-belt Electrodes for Water Purification, Desalination, Waste Treatment and Air Purification
10393	D&NT	(Schnittker) Wide-Band Multi-Crystal Oscillator
10394	NAI	(Yu) Hand-Held Multiple System Gas Chromatograph
10399	D&NT	(Hill) High Temperature Source for Generating Atomic/Molecular Beams of High Intensity and Variable Kinetic Energy
10404	Engineering	(Miles) Use of Impedance Measurements to Detect the Presence of Pathogens Trapped in Electric Field
10407	D&NT	(Perry) Ultrashort-Pulse Laser Machining System Employing a Parametric Amplifier
10410	Engineering	(Simon) Broad Spectrum Biological Pathogen Detector & Instrumentation
10411-CR	Lasers/EUVL	(Hale) Projection Optics Box
10413	C&MS	(Hrubesh) Method for Producing Lightweight, High Strength Carbon Aerogel Composites
10415	Engineering	(Miles) DNA Sizing using Selective Delectrophoretic Trapping or an Isomotive Electrode Set
10416	Engineering	(Miles) Use of Impedance Measurements to Detect the End-Point for PCR DNA Amplification
10418	Engineering	(Logan) A Method for Employing the Substrate of an Active Matraix Flat Panel Imaging Array to Imaging Advantage when Imaging High-Energy X-Rays
10426	D&NT	(Avalle) Distributed Accelerometer Inertial Measurement Unit

10429	Engineering	(Jankowski) MEMS-Based Thin-Film Fuel Cells for Electrical Power Pack Applications
10434	P&ST	(Erskine) Fringing Spectroscopy for Precision Long-baseline Interferometry
10441	E&ES	(Bogen) A Microelectromechanical ("MEMpette") Device for Sorting and Counting Particles (or Cells) in One or More User-specified Sizes from a Liquid Sample and for Dispensing These Particles in User-specified Numbers
10442	E&ES	(Bogen) Microelectromechanically Integrated Nanowell Array Biochip Device for Rapid and Efficient Isolation, Manipulation, and Culture of Single Cells, and for Related Analysis
10445	JPO/Lasers	(Satcher) Novel Fluorescent Compounds for Quantification of Physiological Analytes such as Glucose
10457	Energy	(Post) Improved Passive Magnetic Bearing Configuration
10463	Lasers	(Wilkins) Scanning Phase Knife for Wavefront Slope and Defect Measurement
10466	Energy	(Post) Magnetic Bearing Element with Adjustable Stiffness
10473	Engineering	(Benett) Integrated Miniature Electrical Interconnects for Microelectromechanical and Microfluidic Systems
10477	Engineering	(Larson) Post-growth Digital Wavelength Tuning of Vertical Cavity Surface-Emitting Lasers by Selective Lateral Oxidation
10488	Engineering	(Deri) Compact Multiwavelength Transmitter Module for Multimode Fiber Optic Ribbon Cable
10518	Other	(Alford) Livelink API Management System

Advisor: **BUD CARNAHAN**

DOE Applications Submitted:

CIP Application Sent to DOE:

Continuation/Divisional Application Sent to DOE:

PCT Application Sent to DOE

UC Applications Submitted:

10428	BBRP	(Davidson) Modified Electrokinetic Sample Injection in Chromatography and Electrophoresis Analysis. Application sent PTO Express Mail 8/23/99.

CIP Application

Continuation/Divisional Application:

9609C	(Makowiecki) Divisional Application sent PTO Express Mail 8/23/99
9859B	(Coronado) Divisional Application sent PTO Express Mail 8/23/99

PCT Application

Applications in Preparation:

10146B	Lasers	(Trebes) Miniature X-Ray Source (Division)*(Dispute - on hold)*
10333	NAI	(Madden) Actively Driven Thermal Radiation Shield for a Mechanically Cooled Portable Germanium Gamma-Ray Spectrometer
10365	Energy	(Koo) Paper Area Density Measurement from Forward Transmitted Scattered Light
10394	NAI	(Yu) Hand-Held Multiple Sustem Gas Chromatograph

10401	EE	(Simon) Apparatus for Collection of Respirable Particles
10427	Engineering	Micromachined Low Frequency Rocking Accelerometers with Capacitive Pickoff Fabricated by Deep Reactive Ion Etching
10446	NAI	(Ivanov) Fissile Material Detector
10494	P&ST	Electroless Epitaxial Etching for Semiconductor Applications
10543	NAI	(Koo) Glow Discharge Detector

Prosecution Sent to DOE or PTO:

9193C	(Lee) First Office Action--resp due 9/22/99. Resp sent PTO 8/25/99
9193D	(Lee) First Office Action--resp due 9/22/99. Resp sent PTO 8/25/99
9306	(Moss) First Office Action--resp due 9/23/99. Resp sent PTO 8/25/99
9366 CPA	(Petersen) First Office Action--resp due 8/28/99. Resp sent PTO 8/25/99
9617B	(Nathel) First Office Action--resp due 9/10/99. Resp sent PTO 8/25/99
9707B	(Northrup) Office Action, Prosecution Reopened--resp due 8/26/99. Resp sent PTO 8/25/99
9707C	(Northrup) Office Action, Prosecution Reopened--resp due 8/26/99. Resp sent PTO 8/25/99.
9850	(Benett) Decision of Appeal--resp due 9/19/99. Resp sent PTO 8/25/99
9886	(Aines) First Office Action--resp due 9/17/99. Resp sent PTO 8/25/99
9897	(Morse) First Office Action--resp due 9/9/99. Response with Declaration sent to PTO 8/27/99
9936	(Wieskamp) Final Office Action--resp due 10/16/99. Resp sent PTO 8/25/99.
9949	(Kare) First Office Action--resp due 9/8/99. Resp sent PTO 8/25/99
9962	(Northrup) Notice of Appeal--resp due 8/13/99 w/two month extension. Filed CPA w/two month extension Express Mail 8/4/99
10027	(Jankowski) First Office Action--resp due 9/25/99. Resp sent PTO 8/25/99
10251	(Montcalm) First Office Action--resp due 9/28/99. Resp sent PTO 8/25/99
10268	(Lee) First Office Action--resp due 10/16/99. Resp sent PTO 8/25/99

10298	(Hale) Notice of Allowance, Notice of Allowability--resp due 8/27/99. Issue Fee and Formal drawings sent PTO 8/26/99.
10307	(Spiller) First Office Action--resp due 9/8/99. Resp sent PTO with additional fee 8/27/99.
10372	(Bajt) First Office Action--resp due 10/2/99. Resp sent PTO 8/25/99.

Pending Prosecution:

9032	(Aines) Notice of Allowance, Notice of Allowability--resp due 9/21/99
9276	(Buettner) Notice of Allowance, Notice of Allowabilty--resp due 10/1/99
9398C	(McCarthy) Final Office Action--resp due 10/21/99
9398C	(McCarthy) Notice of Appeal--resp due 10/19/99
9402B	(McCarthy) Final Office Action--resp due 11/3/99
9402B	(McCarthy) Notice of Appeal--resp due 11/1/99
9451B	(Jankowski) Advisory Action--resp due 11/10/99.
9651	**(Carrigan) Notice of Allowance, Notice of Allowability--resp due 9/9/99. Issue Fee and drawings sent PTO 9/1/99**
9561	(Hale) Final Office Action --resp due 10/27/99
9561	(Hale) Notice of Appeal--resp due 10/25/99
9637B	(Makowiecki) Second Office Action--resp due 11/12/99
9705	(Musket) First Office Action--resp due 10/26/99
9713	(Van Konynenburg) Notice of Allowance, Notice of Allowabiltiy--resp due 10/7/99
9730	(Davidson) Notice of Allowance, Notice of Allowability--resp due 10/1/99
9732	(Davidson) Final Office Action--resp due 11/24/99
9732	(Davidson) Notice of Appeal--resp due 11/24/99
9767	(Blaedel) Decision on Appeal 6/25/99. Contact Examiner if no further action by 9/25/99.
9814B	(Carey) First Office Action--resp due 10/30/99
9853	**(Andresen) Advisory Action--resp due 9/13/99. Response was to file CPA 9/1/99.**
9854	**(Andresen) Notice of Allowance, Notice of Allowability--resp due 9/8/99. Issue Fee and drawings sent PTO 9/1/99**
9873	(Krulevitch) Notice of Allowance, Notice of Allowability--resp due 10/6/99
9895B	(Morse) Final Office Action--resp due 11/2/99
9895B	(Morse) Notice of Appeal--resp due 10/31/99
9913	(Musket) Notice of Allowance, Notice of Allowability--resp due 11/4/99
9936	(Wieskamp) Notice of Appeal--resp due 10/14/99

9951	(Kare) Notice of Allowance, Notice of Allowability--resp due 9/30/99.
10007B	(Northrup) Notice of Allowance, Notice of Allowabiltiy--resp due 11/24/99. Supplemental Notice of Allowability--resp due11/24/99.
10024	(Brown) Final Office Action--resp due 11/10/99
10024	(Brown) Notice of Appeal--resp due 11/8/99
10029	(Frank) Notice of Allowance, Notice of Allowability--resp due 11/2/99
10048	(Davidson) Notice of Allowance, Notice of Allowability--resp due 11/2/99
10062	(Chaiken) Appeal Brief due 9/28/99
10088	(Dinh) Notice of Allowance, Notice of Allowability--resp due 10/14/99
10117	(Carey) Notice of Allowance, Notice of Allowability--resp due 10/14/99
10118	(Kallman) First Office Action--resp due 11/25/99
10130	(Pham) Final Office Action--resp due 11/27/99
10130	(Pham) Notice of Appeal--resp due 11/25/99
10159	(Krulevitch) Final Office Action--resp due 11/5/99
10159	(Krulevitch) Notice of Appeal--resp due 11/3/99
10210	**(Mirkarimi) Notice of Allowance, Notice of Allowability--resp due 9/10/99. Issue Fee sent PTO 9/1/99.**
10300	(Benett) First Office Action--resp due 11/10/99
10332FOR	**PCT--resp due 9/21/99 (Bud and Nancy notified). Request sent PTO 9/1/99**
10332FOR	Demand--resp due 10/21/99 (Bud and Nancy notified)
10347FOR	PCT and Demand--resp due 10/26/99 (Bud and Nancy notified).
10349FOR	PCT and Demand--resp due 10/26/99 (Bud and Nancy notified).

Advisor: DARYL GRZYBICKI

DOE Applications Submitted:

CIP Application Sent to DOE:

Continuation/Divisional Application Sent to DOE:

PCT Application Sent to DOE

UC Applications Submitted:

10257	Env.	(Knauss) Hyperbaric Hydrothermal Atomic Force Microscope--SENT PTO 8/3/99

CIP Application

Continuation/Divisional Application:

PCT Application

Applications in Preparation:

9148	C&MS	(Miller) Advanced Multi-Toxic Detection and Filtering System
9232	C&MS	(Miller) Use of Treated Aerogel (for Chemical Specific Absorption) as a Sample Collection Media
9284	ME	(Berg et al.) Aerogel Composites for High Temperature Insulation and Fire Retardation
10091	Other	(Andresen) A New Kovar, Wire Fiber Solid Phase Micro Extraction (SPME) Device...
10178	Lasers	(Law) Ultra-High Density Hollow Magnetic Sensor
10231	C&MS	(Fox) Metals Removal from Waste Streams Using Polymer Pendant Sulfur Complexes
10267	C&MS	(Fox) Metals Removal from Waste Streams using Extraction with Sulfur Ligands
10277	NAI	(Hoffman) Oxidizer Gels for Detoxification of Chemical and Biological Agents

10281	EE	(Folta) Conformal Chemically Resistant Coating for Microflow Devices
10341	JPO	Long Wavelength Intramolecular Fluorescence Switching Sensor for Measuring and Analyte such as Glucose
10370	LAS	(Colston) Hand-held Dental Imaging Device
10379	JPO/ Engineering	(Everett) Birefringence Insensitive OCDR System
10435	JPO	(Darrow) Fluorescence Lifetime Assay for Non-Invasive Quantification of Physiological Analytes such as Glucose
10490	JPO/Lasers	(Brown) Method for Creating Chemical Sensors Using Microjet Technology
10496	JPO/Lasers	(Darrow) A Device for the Detection of Birefringement Micro-Crystals in Bile
10516	BBRP/NAI	(Kadhodayan) Antidotes to Bacterial Toxins

Prosecution Sent to DOE or PTO:

9615	(Weihs) Restriction Requirement--resp due 8/26/99.--SENT PTO 8/23/99
10252	(Sweeney) Notice of Allowance, Notice of Allowability--resp due 8/7/99--SENT PTO 8/9/99
10252	(Sweeney) Amendment After Final--SENT PTO 8/9/99
10253	(Haas) Amendment--resp due 8/25/99--SENT PTO 8/25/99

Pending Prosecution:

8860	(Yu) Final Office Action--resp due 10/28/99
8860	(Yu) Notice of Appeal--resp due 10/26/99
9761C	(Lucas) Appeal Brief--resp due 9/29/99 w/one month extension
9805	(Meyer) Notice of Allowance, Notice of Allowability--resp due 11/9/99
9892	(Poco) Final Office Action--resp due 9/15/99 w/one month extension.
9892	(Poco) Notice of Appeal--resp due 9/13/99 w/one month extension.
9904	(Poco) First Office Action--resp due 9/5/99 w/eight month extension. Notice of Abandonment dated 5/11/99.
9904FOR	Demand--resp due 10/13/99 (DG notified)
9950	(Barry) Notice to file Missing Parts--resp due 10/11/99.
10035	(Shafer) Notice of Allowance, Notice of Allowability--resp due 11/16/99.
10066FOR	National Filing--resp due 9/3/99 (DG notified)--sent to Ladas & Parry (5/24/99) to prepare (per DG's request, lnh)
10122	(Everett) First Office Action--resp due 11/25/99

10208	(Sommargren) Notice of Allowance, Notice of Allowability--resp due 10/6/99.
10221	(Cooper) First Office Action--resp due 10/8/99.
10252FOR	Demand--resp due 9/19/99 (Sent Fax requesting Ladas & Parry to prepare Demand..per DG (lnh)
10252B	(Sweeney) Final Office Action--resp due 9/27/99 w/two month extension--sent to Paul Tomita (Dergosits) to prepare (sent on 5/7/99)
10263	**(Chapman) Notice of Allowability --resp due 9/3/99--SENT PTO 9/3/99. Notice of Allowance--- resp due 9/15/99--SENT PTO 9/3/99. (Note prior NOA 9/3/99 date)**
10313	(Montcalm) First Office Action--resp due 10/30/99

Misc. Projects

Completed

Pending

Advisor: JOHN WOOLDRIDGE

DOE Applications Submitted:

CIP Application Sent to DOE:

Continuation/Divisional Application Sent to DOE:

PCT Application Sent to DOE

UC Applications Submitted:

CIP Application

Continuation/Divisional Application:

PCT Application

Applications in Preparation:

9928	NAI	(Ruggiero) Integrated Optical Capillary Electrophoresis Chemical Microsensor
10028	Lasers	(Velsko) Compact, Flexible, Frequency Agile Parametric Wavelength Convertor
10078	Lasers	Monolithic Microchannel-cooled V-groove Microlensed Laser Diode Array
10209	Lasers	(Sommargen) Application of the PSDI for Measuring Convex Mirrors and Negative Lenses
10223	P&ST	(Frank) High-Resolution, Cryogenic X-Ray Detector With High Count Rate Capability
10334	Lasers	(Bajt) A Technique to Quantitatively Measure Magnetic Properties of Thin Structures at <10 nm Spatial Resolution
10344	JPO/Lasers	(Visuri) Photoacoustic Enhanced Drug Delivery with an Echo-Contrast Agent

10366	Lasers	(Banks) Method to Reduce Damage to Backing Plate using Prepulse
10391	Lasers	(Ishikawa) Gamma Watermarking
10398	Lasers	(Rushford) Optical Monitor for Real Time Thickness Change Measurements
10417-CR	Lasers	(Beach) Design for Delivering Pump Light to a Laser Gain Element while Maintaining Access to the Laser Beam
10447	Lasers	(Ishikawa) Composition Analysis by Scanning Femtosecond Laser Ultraprobing (CASFLU)
10459	Lasers	Coherent Beam Combiner for a High Power Laser
10483	Lasers	(Hackel) Ablation and Insulation Layer for Laser Peening
10520	Lasers	(Wilcox) Antiguided Fiber Ribbon Laser
10530	Lasers	(Sommargren) Inspection of Lithographic Mask Blanks for Defects
10558 CR	Lasers	(Hackel) Contour Forming of Metals by Means of Laser Peening

Prosecution Sent to DOE or PTO:

9444	(Mariella) First Office Action--resp due 8/24/99 (three month extension). Resp sent 8/24/99
9493B	(Toeppen) Notice of Appeal sent 8/22/99 (three month extension)
9581	(Vernon) Notice of Allowance, Notice of Allowability--resp due 9/21/99. Issue Fee sent 8/27/99. Formal Drawings sent 8/30/99.
9689	(Sheem) First Office Action--resp due 8/5/99 (three month extension). Resp sent 8/5/99.
9869	(Celliers) Notice of Allowance and Notice of Allowability--resp due 8/24/99. Resp sent 8/23/99.
9912	(Kyle) Final Office Action--resp due 8/10/99 (three month extension). Resp sent 8/10/99.
10031	(Matthews) Notice of Allowance, Notice of Allowability resp due-- 8/28/99. Resp sent 8/26/99
10142A	(Vann) Second Office Action-resp due 8/9/99 (three month extension). Resp sent 8/9/99.
10142B	(Vann) Final Office Action--resp due 8/9/99 (three month extension). Resp sent 8/9/99.
10244	(Stuart) Notice to File Missing parts--resp due 8/20/99 (one month extension). Resp sent 8/17/99
10326	(Banks) Notice to File Missing Parts--resp due 8/15/99. Resp sent 8/13/99

Pending Prosecution:

9044	(Jones/Post) Appeal Brief with Petition to Revive--resp due 9/21/99
9493B	(Toeppen) Appeal Brief--resp due 10/22/99
9566B	(Perry) Final Office Action--resp due 9/4/99
9566B	(Perry) Notice of Appeal--resp due 9/4/99
9567FOR	**(McEwan) European office action--resp due in Europe 9/5/99 (due to L/P before 9/5). THIS IS NOT EXTENDABLE.**
9676	(Holzrichter) Notice of Allowance, Notice of Allowability--resp due 9/28/99
9762	(Burkhart) Final Office Action--resp due 10/30/99
9762	(Burkhart) Notice of Appeal--resp due 10/28/99
9860	(Hackel) Third Office Action--resp due 9/5/99. (three month extension)
9889	(Rogalski) First Office Action--resp due 9/17/99. (three month extension)
9912	(Kyle) Notice of Allowance, Notice of Allowability--resp due 11/26/99
9926	(Post) First Office Action--resp due 10/1/99.
9967	(Goerz) First Office Action--resp due 9/27/99 (two month extension)
9969	(Regents) Notice to File Missing Parts (US national stage)--resp due 9/2/99 (two month extension). Ladas & Parry will file this. TC sent to L/P on 8/5/99.
10000	(Erskine) Final Office Action--resp due 9/15/99 (one month extension)
10000	(Erskine) Notice of Appeal--resp due 9/15/99 (one month extension)
10038	(Small) John wants to file a CIP by or on 11/16/9 (before or on date of paying issue fee)
10038	(Small) Notice of Allowance, Notice of Allowability--resp due 11/16/99
10126	(Perry) Final Office Action--resp due 9/18/99 (three month extension).
10126	(Perry) Notice of Appeal--resp due 9/16/99 (three month extension).
10167	(Hackel) First Office Action--resp due 10/12/99.
10170	(Vann) First Office Action--resp due 10/22/99
10225	(Visuri) First Office Action--resp due 9/30/99 (three month extension).
10304FOR	PCT Application and Demand--resp due 9/15/99 (JW and TC notified)
10340	(Freitas) Notice to File Missing Parts--resp due 10/18/99

10351	(Yang) Preliminary Amendment to cover deleted items--resp due 9/22/99
10351FOR	Provisional Filing and Demand--resp due 9/10/99 (JW and TC notified)
10549	Trademark -- Peregrine Dose Calculation Engine. Notice of Allowance -- resp due 11/4/99
10550	Trademark -- Peregrine 3-D Monte Carlo. Notice of Allowance -- resp due 11/4/99

Misc. Projects:
Completed

Pending

Monthly Report Worksheet - AUGUST 1999

Advisor: ALAN THOMPSON

DOE Applications Submitted:

CIP Application Sent to DOE:

Continuation/Divisional Application Sent to DOE:

PCT Application Sent to DOE

UC Applications Submitted:

CIP Application

Continuation/Divisional Application:

PCT Application

Applications in Preparation:

9935B	D&NT	(Haigh) High Voltage Photovoltaix Power Converter
10256	Engineering / BBRP	(Miles) Streamline Separation of Cells Using Dielectrophoretic Force
10283	C&MS	(Musket) Formation of Nanometer-Size Wires Using Infiltration into Latent Nuclear Tracks
10367	D&NT	(Kirbie) Compact Pulsed Power Source
10368	D&NT	(Caporaso) Improved Compact Accelerator
10369	D&NT	(Sampayan) Compact Pulsed Lithography System
10420	Energy	(Post) A Combined Passive Magnetic Bearing Element and Vibration Damper
10437	Environmental	(Berryman) Robust Discrimination of Porosity and Fluid Saturation using Seismic Velocity Analysis

10489	Environmental	(Leif) Increasing Effective Water Solubility of Organic Contaminants and Petroleum by Aqueous Thermal Oxidation
10534	Energy	(Hunter) Rotational Rate Sensor

Prosecution Sent to DOE or PTO:

Pending Prosecution:

8737	(DeTeresa) New Final Office Action--resp due 11/17/99.
9958	(Hagans) First Office Action--resp due 9/7/99.
10206	(Bennahmias) Notice to File Missing Parts--resp due 10/12/99.
10271	(Penetrante) First Office Action--resp due 11/13/99.
10275	(Penetrante) First Office Action--resp due 11/16/99

Misc. Projects:

Completed

Pending

Monthly Report Worksheet - AUGUST 1999

Advisor: LLOYD DAKIN

DOE Applications Submitted:

CIP Application Sent to DOE:

Continuation/Divisional Application Sent to DOE:

PCT Application Sent to DOE

UC Applications Submitted:

10265	Energy	(Hernandez) System and Method for 100% Moisture and Basis Weight Measurement of Moving paper--SENT PTO 8/30/99 (lnh)

CIP Application

Continuation/Divisional Application:

PCT Application

Applications in Preparation:

10082	DO	(Burnett) New EM Sensor/Acoustic Electronic and Numerical Algorithms
10318	JPO/ Engineering	(Haddad) Method for Transmission-mode Ultrasonic Tomography
10319	JPO/ Engineering	(Haddad) Method for Reflection-mode Ultrasonic Tomography
10321	JPO/ Engineering	(Haddad) Ultrasonic Breast Imaging System
10360	NAI	(Coffland) Random Number Generator for Real-Time Media Encryption
10400	Energy	(Hunter) Tiltmeter Leveling Mechanism
10409	Energy	(Hunter) Self Adjusting Inclinometer
10443	Computation	DataFoundry Software

10524	BBRP	(Kuczmarski) MPGSS (Massively Parallel Genomic Similarity Search)
10557	EE	(Carlisle) Two Coordinate Measuring System

Prosecution Sent to DOE or PTO:

10147FOR	PCT--resp due 8/7/99 (Lloyd notified)--SENT PTO 8/3/99
10147FOR	Demand--resp due 9/3/99 -- SENT PTO 8/25/99 (lnh)

Pending Prosecution:

9578	(Strait) Notice of Allowance, Notice of Allowability--resp due 10/19/99. Supplemental Notice of Allowability--resp due 10/19/99.
10085	(Bernhardt) First Office Action--resp due 11/23/9
10147FOR	Invit to Correct Defects--resp due 9/25/99
10200FOR	Notice to Correct Defects--resp due 9/18/99.
10219	(Fullerson) First Office Action--resp due 9/23/99 w/two month extension
10350FOR	PCT and Demand--resp due 11/12/99 (Lloyd notified)
10469	(Vanarsdall) DOE requests formal invention disclosure--resp due 4/30/99.

Misc. Projects:

Completed

Pending

Advisor: FARM OUT

DOE Applications Submitted:

CIP Application Sent to DOE:

Continuation/Divisional Application Sent to DOE:

PCT Application Sent to DOE

UC Applications Submitted:

CIP Application

Continuation/Divisional Application:

PCT Application

Applications in Preparation:

10395	Lasers	(Chapman et al) DG sent request to Dergosits & Noah (8/9/99) to prepare estimate to prepare CIP.
10516	BBRP	(Kadkhodayan et al) Antidotes to Bacterial Toxins..7/8/99 requested Wilson Sonsini to prepare Application and IDS per DG (lnh).

Prosecution Sent to DOE or PTO:

9257B	(Lucas) First Office Action Sent To Wilson Sonsini to prepare--resp due 10/2/99. Resp sent PTO by Wilson Sonisini 8/27/99
10011	(Satcher) Notice of Allowance, Notice of Allowability--resp due 10/20/99--resp sent by Townsend & Townsend on 8/9/99

Pending Prosecution:

8567A FOR	(Turtletaub) First Office Action -- resp due 10/29/99
9091FOR	(McEwan) Second Office Action--resp due 11/16/99.

9509	(Barbee) Office Action in Reexamination --resp due 10/11/99 (Wilson Sonsini is preparing per DG)
9567FOR	(McEwan) First Office Action--resp due PCT/Europe 9/5/99 w/two month extension. (Ladas & Parry)
10210FOR	Demand--resp due 9/19/99 (DG sent request to Ladas & Parry on 8/10/99 to prepare Demand)
10226	(Visuri) First Office Action file by Majestic, Parsons...--resp due 9/26/99 w/one month extension.
10251FOR	Demand--resp due 9/19/99 (DG sent to Ladas & Parry for preparation)
10297FOR	PCT Application--resp due 9/30/99 (DG sent ltr to Ladas & Parry on 8/23/99 requesting they prepare PCT Application)
10307FOR	PCT Application--resp due 9/25/99 (DG sent ltr to Ladas & Parry on 8/23/99 requesting they prepare PCT Application)

Monthly Report Worksheet - SEPTEMBER 1999

Advisor: JOHN WOOLDRIDGE

DOE Applications Submitted:

CIP Application Sent to DOE:

Continuation/Divisional Application Sent to DOE:

PCT Application Sent to DOE

UC Applications Submitted:

10223	P&ST	(Frank) A Cryogenic, High-Resolution X-Ray Detector With High Count Rate Capability
10417-CR	Lasers	(Beach) Design for Delivering Pump Light to a Laser Gain Element while Maintaining Access to the Laser Beam

CIP Application

Continuation/Divisional Application:

PCT Application

10304FOR	JPO/Lasers	(Haddad) Microwave Hematoma Detector
10351FOR	Physics	(Yang) FALCON: Automated Optimization Method for Arbitrary Assessment Criteria

Applications in Preparation:

9928	NAI	(Ruggiero) Integrated Optical Capillary Electrophoresis Chemical Microsensor
10028	Lasers	(Velsko) Compact, Flexible, Frequency Agile Parametric Wavelength Convertor
10078	Lasers	Monolithic Microchannel-cooled V-groove Microlensed Laser Diode Array
10209	Lasers	(Sommargen) Application of the PSDI for Measuring Convex Mirrors and Negative Lenses
10334	Lasers	(Bajt) A Technique to Quantitatively Measure Magnetic Properties of Thin Structures at <10 nm Spatial Resolution

Monthly Report Worksheet
For the Period
October 1, 1999 to October 31, 1999

ATTACHMENT S-3

Advisor: JOHN WOOLDRIDGE

DOE Applications Submitted:

CIP Application Sent to DOE:

Continuation/Divisional Application Sent to DOE:

PCT Application Sent to DOE

U C Applications Submitted:

10078	Lasers	Monolithic Microchannel-cooled V-groove Microlensed Laser Diode Array
10605	Copyright	Copyright application mailed 10/13/99. PEREGRINE

CIP Application

Continuation/Divisional Application:

PCT Application

10326FOR	Lasers	(Perry) Ultrashort Pulse Laser Deposition of Thin Films. Application sent 10/11/99.

Applications in Preparation:

9928	NAI	(Ruggiero) Integrated Optical Capillary Electrophoresis Chemical Microsensor
10028	Lasers	(Velsko) Compact, Flexible, Frequency Agile Parametric Wavelength Convertor
10209	Lasers	(Sommargen) Application of the PSDI for Measuring Convex Mirrors and Negative Lenses
10334	Lasers	(Bajt) A Technique to Quantitatively Measure Magnetic Properties of Thin Structures at <10 nm Spatial Resolution
10344	JPO/Lasers	(Visuri) Photoacoustic Enhanced Drug Delivery with an Echo-Contrast Agent
10366	Lasers	(Banks) Method to Reduce Damage to Backing Plate using Prepulse
10391	Lasers	(Ishikawa) Gamma Watermarking

Advisor: JOHN WOOLDRIDGE

DOE Applications Submitted:

CIP Application Sent to DOE:

Continuation/Divisional Application Sent to DOE:

PCT Application Sent to DOE

UC Applications Submitted:

CIP Application

Continuation/Divisional Application:

PCT Application

Applications in Preparation:

9928	NAI	(Ruggiero) Integrated Optical Capillary Electrophoresis Chemical Microsensor
10028	Lasers	(Velsko) Compact, Flexible, Frequency Agile Parametric Wavelength Convertor
10037	Lasers	(Frietas) Ruggedized, Microchannel-Cooled Laser Diode Array
10209	Lasers	(Sommargen) Application of the PSDI for Measuring Convex Mirrors and Negative Lenses
10334	Lasers	(Bajt) A Technique to Quantitatively Measure Magnetic Properties of Thin Structures at <10 nm Spatial Resolution
10344	JPO/Lasers	(Visuri) Photoacoustic Enhanced Drug Delivery with an Echo-Contrast Agent
10366	Lasers	(Banks) Method to Reduce Damage to Backing Plate using Prepulse
10391	Lasers	(Ishikawa) Gamma Watermarking
10398	Lasers	(Rushford) Optical Monitor for Real Time Thickness Change Measurements

Monthly Report Worksheet - DECEMBER 1999

Advisor: JOHN WOOLDRIDGE

DOE Applications Submitted:

CIP Application Sent to DOE:

Continuation/Divisional Application Sent to DOE:

PCT Application Sent to DOE

UC Applications Submitted:

10530	Lasers	(Sommargren) Inspection of Lithographic Mask Blanks for Defects. Application sent PTO 12/07/99 Express Mail.

CIP Application

Continuation/Divisional Application:

10038B		(Small) Single-Fiber Multi-Color Pyrometry. Divisonal sent PTO 12/16/99.

PCT Application

Applications in Preparation:

9928	NAI	(Ruggiero) Integrated Optical Capillary Electrophoresis Chemical Microsensor
10028	Lasers	(Velsko) Compact, Flexible, Frequency Agile Parametric Wavelength Convertor
10037	Lasers	(Frietas) Ruggedized, Microchannel-Cooled Laser Diode Array
10209	Lasers	(Sommargen) Application of the PSDI for Measuring Convex Mirrors and Negative Lenses
10334	Lasers	(Bajt) A Technique to Quantitatively Measure Magnetic Properties of Thin Structures at <10 nm Spatial Resolution
10344	JPO/Lasers	(Visuri) Photoacoustic Enhanced Drug Delivery with an Echo-Contrast Agent

Monthly Report Worksheet – JANUARY 2000

Advisor: JOHN WOOLDRIDGE

DOE Applications Submitted:

CIP Application Sent to DOE:

Continuation/Divisional Application Sent to DOE:

PCT Application Sent to DOE

UC Applications Submitted:

10370	JPO/Lasers	Hand-Held Dental Imaging Device. Application sent PTO Express Mail 1/24/2000.
10443	Computations / BBRP	Data Foundry Software. (from Dakin) Application sent PTO express mail 1/7/2000.
10459	Lasers	(Hackel) Coherent Beam Combiner for a High Power Laser Application sent PTO 1/31/2000

CIP Application

Continuation/Divisional Application:

PCT Application

Applications in Preparation:

9928	NAI	(Ruggiero) Integrated Optical Capillary Electrophoresis Chemical Microsensor
10028	Lasers	(Velsko) Compact, Flexible, Frequency Agile Parametric Wavelength Convertor
10037	Lasers	(Frietas) Ruggedized, Microchannel-Cooled Laser Diode Array
10209	Lasers	(Sommargen) Application of the PSDI for Measuring Convex Mirrors and Negative Lenses
10334	Lasers	(Bajt) A Technique to Quantitatively Measure Magnetic Properties of Thin Structures at <10 nm Spatial Resolution

Monthly Report Worksheet – FEBRUARY 2000

9928	NAI	(Ruggiero) Integrated Optical Capillary Electrophoresis Chemical Microsensor
10028	Lasers	(Velsko) Compact, Flexible, Frequency Agile Parametric Wavelength Convertor
10037	Lasers	(Frietas) Ruggedized, Microchannel-Cooled Laser Diode Array
10209	Lasers	(Sommargen) Application of the PSDI for Measuring Convex Mirrors and Negative Lenses
10318	JPA/Eng	(Haddad) Method of for Transmission-mode Ultrasonic
10319	JPA/Eng	(Haddad) Method for Reflection-mode Ultrasonic Tomography
10321	JPO/ Engineering	(Haddad) Ultrasonic Breast Imaging System
10344	JPO/Lasers	(Visuri) Photoacoustic Enhanced Drug Delivery with an Echo-Contrast Agent
10366	Lasers	(Banks) Method to Reduce Damage to Backing Plate using Prepulse
10395	Lasers	(Chapman) Condenser for Ring-Field Deep-Ultraviolet and Extreme Ultraviolet Lithography. DG sent request to Dergosits & Noah (9/9/99) to prepare Continuation application
10398	Lasers	(Rushford) Optical Monitor for Real Time Thickness Change Measurements
10407	D&NT/ Lasers	(Perry) Ultra-Short Pulse Laser Machining System Employing a Parametric Amplifier
10447	Lasers	(Ishikawa) Composition Analysis by Scanning Femtosecond Laser Ultraprobing (CASFLU)
10483	Lasers	(Hackel) Ablation and Insulation Layer for Laser Peening
10520	Lasers	(Wilcox) Antiguided Fiber Ribbon Laser
10541	Lasers	(Zapata) Method for Optical Pumping of Thin Laser Media at High Average Power
10558 CR	Lasers	(Hackel) Contour Forming of Metals by Means of Laser Peening

Prosecution Sent to DOE or PTO:

9044	(Jones/Post) Appeal Brief with Petition to Revive--resp due 12/7/99 Appeal Bried sent with 4 month extension 3/8/2000.
9967	(Goerz) Notice of Allowance, Notice of Allowability--resp due 4/12/2000. Issue Fee and Drawings sent PTO 2/2/2000
10095CPA	(Visuri) Notice of Allowance, Notice of Allowability--resp due 3/6/99. Issue Fee and Drawings sent PTO 2/8/00.
10122	(Everett) First Office Action--resp due 12/25/99 w/ 1 month extension. (from Daryl) Response sent PTO with 3 month extension 2/25/2000

Advisor: JOHN WOOLDRIDGE

UC Applications Submitted:

10334	Lasers	(Bajt) A Technique to Quantitatively Measure Magnetic Properties of Thin Structures at <10 nm Spatial Resolution. Application sent PTO express mail 3/1/2000.
10472	Physics	(Wittenau) Correlated Histogram Representation of Monte Carlo Derived Medical Accelerator Photon-Output Phase Space. 9/30/99: Application sent PTO 3/7/2000

CIP Application

10667		(Chapman) Condenser for Ring-Field Deep-Ultraviolet and Extreme-Ultraviolet Lithography. This was IL-10395B. Application sent PTO 3/14/2000.

Continuation/Divisional Application:

PCT Application

10472FOR	Physics	IPAC has notified us to proceed with the Provisional PCT Request. Request sent PTO 3/8/2000

Applications in Preparation:

9928	NAI	(Ruggiero) Integrated Optical Capillary Electrophoresis Chemical Microsensor
10028	Lasers	(Velsko) Compact, Flexible, Frequency Agile Parametric Wavelength Convertor
10037	Lasers	(Frietas) Ruggedized, Microchannel-Cooled Laser Diode Array
10209	Lasers	(Sommargen) Application of the PSDI for Measuring Convex Mirrors and Negative Lenses
10318	JPA/Eng	(Haddad) Method of for Transmission-mode Ultrasonic
10319	JPA/Eng	(Haddad) Method for Reflection-mode Ultrasonic Tomography
10321	JPO/ Engineering	(Haddad) Ultrasonic Breast Imaging System
10344	JPO/Lasers	(Visuri) Photoacoustic Enhanced Drug Delivery with an Echo-Contrast Agent

Monthly Report Worksheet – APRIL 2000

ATTACHMENT S-9

Advisor: JOHN WOOLDRIDGE

UC Applications Submitted:

10366	Lasers	(Banks) Method to Reduce Damage to Backing Plate using Prepulse

CIP Application

Continuation/Divisional Application:

PCT Application

Applications in Preparation:

9928	NAI	(Ruggiero) Integrated Optical Capillary Electrophoresis Chemical Microsensor
10028	Lasers	(Velsko) Compact, Flexible, Frequency Agile Parametric Wavelength Convertor
10037	Lasers	(Frietas) Ruggedized, Microchannel-Cooled Laser Diode Array
10209	Lasers	(Sommargen) Application of the PSDI for Measuring Convex Mirrors and Negative Lenses
10318	JPA/Eng	(Haddad) Method of for Transmission-mode Ultrasonic
10344	JPO/Lasers	(Visuri) Photoacoustic Enhanced Drug Delivery with an Echo-Contrast Agent
10398	Lasers	(Rushford) Optical Monitor for Real Time Thickness Change Measurements
10407	D&NT/ Lasers	(Perry) Ultra-Short Pulse Laser Machining System Employing a Parametric Amplifier
10447	Lasers	(Ishikawa) Composition Analysis by Scanning Femtosecond Laser Ultraprobing (CASFLU)
10483	Lasers	(Hackel) Ablation and Insulation Layer for Laser Peening
10520	Lasers	(Wilcox) Antiguided Fiber Ribbon Laser
10541	Lasers	(Zapata) Method for Optical Pumping of Thin Laser Media at High Average Power
10558 CR	Lasers	(Hackel) Contour Forming of Metals by Means of Laser Peening

Prosecution Sent to DOE or PTO:

MONTHLY REPORT
For the Period May 1, 2000 to May 31, 2000

Advisor: EDDIE SCOTT

UC Applications Submitted:

CIP Application

Continuation/CIP/Divisional Application:

PCT Application

Applications in Preparation:

9928	NAI	(Ruggiero) Integrated Optical Capillary Electrophoresis Chemical Microsensor
10387	Physics	(Wolfe) Reflective for Radiation Protection During Processing
10490	JPO/Lasers	(Brown) Method for Creating Chemical Sensors Using Microjet Technology. Provision sent PTO Express Mail 1/20/2000.
10507	Lasers	(Honea) Optical Coatings for Parasitic Suppression with Near Unity Low Angle Reflectivity
10639	Lasers	(Aulf) High Average Power Laser using a Transverse Flowing Liquid Host
10641	Lasers	(Aulf) Device for Wavefront Correction in an Ultra High Power Laser

Prosecution Sent to DOE or PTO:

Pending Prosecution:

08/03/2000	9950	First Office Action—resp. due 8/3/2000. Was Daryl's.

Misc. Projects:

ATTACHMENT S-11

Eddie Scott June 2000

Monday	Tuesday	Wednesday	Thursday	Friday
			1	2
5	6 IPAC Patent Reviews 9:00 am BBRP 10:00 am NAI 12:30 lunch Jim Skorich 2:30 prepare for Pratt/Whitney mtg 3:35 DMV appt	7 IPAC Patent Reviews 9:45 am Environmental 10:00 am Energy 1:30 Tony Ruggiero (here)	8 IPAC Patent Reviews 10:00 am Lasers 11:00 am Lab Site Operations 12:00 Noon Chili Cook Off 1:15 Physics 1:30 Engineering	9 *Time Cards* 9:00 Paul Wickboldt 10:00 Tulk All Hands Mtg @ conf. rm
12 2:00 pm Amal Mtg @Here	13 10: am Bruce Tarter Announcement 2:00 EUV Lab TV	14 10:30 am Tulk staff mtg	15	16 *Time Cards*
19 4:00 Mtg Off Site	20 *Time Cards*	**21 Eddie on VACATION**	**22 Eddie on VACATION** *4:00 pm Patent Celebration West Cafeteria*	**23 Eddie on VACATION**
26 Meeting Off Site 4:30 pm	27 10:30 Patent Priority mtg @ here	28 10:30 am Jan's Staff Meeting 1:15 pm Rod Balhorn	29 5:30 pm Evalina	30 *Time Cards* Joe Carrere After 5:00 pm

July 2000

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4 4th of July	5	6 9:30 AM Holzrichter 3:00 PM IPAC Linda Lerner	7 12:00 PM Director's Office Party	8
9	10	11 9:15 AM IPAC Reviews 9:15-noon: NAI & JPO 10:30 AM Patent Priority mtg 1:30 PM IPAC Reviews 1:30-3:00: Comp & BBRP	12 8:30 AM IPAC Reviews 8:30-noon: Chem, Environ, D&NT, Energy, Engineering 10:30 AM Tulk Staff Mtg @ conf rm	13 10:00 AM IPAC Reviews 10:00-noon: Lasers, Physics, LSO	14 8:00 AM Time cards	15
16	17	18	19 4:30 PM Mtg. off site Tom Patterson	20 5:30 PM Evelina at 5:30	21 8:00 AM Time cards	22
23	24 8:30 AM Security (B274 Rm 1014)	25 10:30 AM Patent Priority Mtg	26 10:30 AM Tulk Staff Mtg @ conf rm	27 10:00 AM mtg off site Richard Otter UC Merced 11:30 AM BBQ	28 8:00 AM Time cards	29
30	31					

August 2000

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 8:00 AM Stanford Medical Center	2 8:00 AM Stanford Medical Center	3 8:00 AM Stanford Medical Center	4 8:00 AM Time cards	5
6	7 12:00 PM Pack Office for Move	8 8:00 AM New Office Being Outfitted - Work Out of Conference Room	9 8:15 AM Move Into New Office	10	11 8:00 AM Time cards	12
13	14 5:00 PM Hacienda Motors Tomorrow	15 7:30 AM Hacienda Motors	16	17	18 8:00 AM Time cards	19
20	21	22 10:30 AM Patent Priority Mtg 3:00 PM Meeting with Annemarie @ My office	23 10:30 AM Tulk Staff Mtg @ conf rm	24 1:30 PM Meeting with Billy Colston @ My Office	25 8:00 AM Time cards 11:00 AM Dr. Appointment Dr. Braker	26 11:00 AM Dr. Braker
27	28	29	30 3:15 PM Evelina at 5:00 pm 4:00 PM carpets will be cleaned on Wednesday, August 30. They plan on starting at 4:00 p.m.	31 11:30 AM Lunch with Jim		

September 2000

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 8:00 AM Time cards	2
3	4 Labor Day	5	6	7 2:00 PM Klaus Kirschner, European Patent Attorney Visit 4:00 PM carpets will be cleaned. They plan on starting at 4:00 p.m.	8 8:00 AM Time cards 1:00 PM Eye Doctor Apppointment - Dr. Leong, Walnut Creek	9
10	11	12	13	14 10:45 AM Time cards 1:30 PM MRI "Lasers" Workshop	15 8:00 AM MRI "Lasers" Workshop 10:30 AM Laboratory Counsel's Office Picnic	16
17	18 11:30 AM Telephone Conversation with John Holzrichter	19 9:15 AM Bob Naismith 11:45 AM University of Glasgow	20 8:00 AM Biotechnology & Software Patent Seminar - Milbrae	21 9:00 AM Meeting with Paul Wickbolt IL 10387 - Reflective Coating for Radiation Protection @ EES Office 10:00 AM Presentation: patent drafting by Bud @ room 1034	22 8:00 AM Time cards 9:00 AM Meeting with Ray Beach - IL 10507 - Optical Coatings for Parasitic Suppression @ EES Office 11:00 AM Meeting with Courtney Davidson - IL 10217 System and Method for Chromatography @ EES Office 4:00 PM LEON PANETTA Lecture	23
24	25 8:00 AM Dr. Appointment at 8:00 AM in Danville	26 10:30 AM Patent Priority Mtg	27 10:00 AM Jan Tulk State of the Lab Presentation @ Rm 1034	28 3:00 PM Dr. Appointment at 3:30 PM in Walnut Creek	29 8:00 AM Time cards 5:00 PM Evelina at 5:30	30

Eddie Scott - printed Thursday, September 28, 2000 11:19 AM

October 2000

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4 9:30 AM Dental Appointment in Danville at 10:00 AM Sue Kone @ Danville 10:30 AM Tulk Staff Mtg @ conf rm 2:30 PM Tony Ruggerio @ EES Office	5	6 8:00 AM Time cards	7
8	9	10 8:00 AM German Auto Care	11 5:00 PM Peter & Helen Gram	12 8:00 AM Time cards 11:30 AM Dr. Appointment (Endo)	13 8:00 AM Vacation Day	14
15	16	17	18 7:30 AM Concord Termite Company	19	20 4:00 PM CLE - Conflicts of Interest TAPE 23A	21
22	23 8:00 AM CLE - Conflicts of Interest TAPE 23B 9:00 AM -------------------- 10:00 AM CLE - Law Office Computer Ethics TAPE 25B 11:15 AM -------------------- 12:00 PM CLE - Selected Problems in Ethics TAPE 25A 5:00 PM Milton & Peggy McGinty from	24 10:30 AM Patent Priority Mtg	25 10:00 AM Time cards 12:00 PM Dr. Appointment (Walnut Creek @ 12:45)	26 8:00 AM VACATION - Vistors from Houston	27 8:00 AM VACATION - Vistors from Houston	28
29	30	31				

November 2000

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1 2:00 PM Tulk Staff Mtg @ conf rm	2 7:30 AM Breakfast at Poppy Ridge with DOE Attorneys 8:30-9:30 am @ Poppy Ridge 8:30 AM DOE attorneys @ Poppy Ridge	3 8:00 AM Dentist Appointment 2:15 PM Time cards	4
5	6	7 8:00 AM VOTE 9:00 AM IPAC Meeting - Engineering 10:00 AM IPAC Meeting - D&NT	8 5:00 PM Evalina at 5:30	9 7:30 AM Meeting with Mike Numenmacher	10 8:00 AM Time cards 10:00 AM Aliphcom and WSGR visitors	11
12	13 1:30 PM Applied Energy Technologies and Health and Ecological Assessment 1:30 to 3 p.m. @ in the Bldg. 123 auditorium.	14	15 10:30 AM Tulk Staff Mtg @ conf rm 2:00 PM Duncan Maitland @ Here	16	17 7:30 AM Hacienda Motors 10:00 AM Meeting Bill Bennett @ Trailer 1527 conference room 12:30 PM Time cards 1:30 PM Tony Ruggerio 1:30 pm for a meeting on IL-9928?	18
19	20	21 3:30 PM Time cards 4:00 PM Time cards	22	23 Thanksgiving	24 Thanksgiving	25
26	27 1:30 PM Geophysics and Global Security Division and Fission Energy and Systems Safety Program @ Bld 123	28 10:30 AM Patent Priority Mtg 12:00 PM Offsite Meeting - 11:30 am	29 10:30 AM Tulk Staff Mtg @ conf rm	30		

December 2000

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 8:00 AM Time cards 12:00 PM Ladies Lunch	2
3	4 1:30 PM Yucca Mountain Program and Geosciences and Environmental Technology @ Bld 123	5	6	7 9:45 AM pack up office 1:00 PM IPAC Holiday Open House 1:00-3:00 @ T6925 Conference Room 3:15 PM Off Site Meeting at 4:30	8 8:00 AM Time cards 9:00 AM Carpet Installation 11:00 AM DOE Intellectual Property Law Lunch @ The Brass Door	9
10	11 7:00 AM Carpet Installation 9:00 AM Director's Office Open House 3:00 PM Meeting Al Thompson & John Holzrichter	12 10:00 AM Rod Balhorn & Ann Lee	13 12:00 PM Lab Site Operations Open House @ B551 R2400	14 10:00 AM Meeting Diane Gates-Anderson 2:30 PM Thomas Karl - Changes in Climate @ Bldg 123 4:30 PM Bring Desert for Tomorrow's Open House	15 8:00 AM Time cards 9:00 AM Lab Counsel's Office Holiday Open House	16
17	18 12:30 PM Atmospheric Sciences Division and ARAC Programs and Tour @ Bldg 123 2:00 PM kick off mtg "institutional tutorials/workshops" @ B6925 R1110	19	20 11:45 AM Lab Counsel's Office Holiday Luncheon	21 10:30 AM Mtg with Derek Deker - IL 10492 11:30 AM Meeting Offsite 2:00 PM Meeting Benett, Koopman, & Jim Richards at 2pm in T1527	22 8:00 AM Time cards	23
24	25 Christmas	26 Christmas	27 8:00 AM Check Holzrichter Pat & App/Mcween	28	29 8:00 AM Time cards	30
31						

January 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1 New Year's Day	2 New Year's Day	3	4 8:00 AM Check Mail Box Expires Today	5 10:00 AM Time cards	6
7	8 10:00 AM Meeting at Ray Marellia's Office (Includes Don Lambert)	9	10 10:30 AM Staff Meeting 12:00 PM Patent Attorney Lunch	11	12 10:00 AM Time cards	13
14	15 8:00 AM HOLIDAY	16	17 2:30 PM Michael Meltzer IL 10598 @ 5475 Room 1225	18 3:30 PM Meeting Off-Site	19 10:00 AM Time cards	20
21	22	23 10:15 AM Al Thompson, Staff Meeting	24	25 2:00 PM Bert Weis, Patent Priority Meeting @ Patent Conf. Rm	26 10:00 AM Time cards	27
28	29	30	31			

February 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2 9:00 AM Meeting with Collin Lau 3:00 PM Time cards 5:00 PM Appointment with Evalina at 5:30	3
4	5 8:00 AM Check Post Office Box - Expired 2/4/01	6	7 2:00 PM Staff Meeting	8 9:00 AM Henry Enos at 9:00 am @ My Office 3:30 PM Ratner of U of Wash Biomaterials That Heal 3:30 p.m. Thursday, Feb. 8 @ Bldg.123 auditorium	9 10:00 AM Time cards 3:30 PM Bob Kuckuck's Retirement Reception @ West Cafe	10
11	12	13	14	15	16 10:00 AM Time cards	17
18	19 8:00 AM President's Day HOLIDAY 9:00 AM HOLIDAY	20	21	22 10:30 AM Future Security in a Technology Rich World" by T.J. Gilmartin @ Bldg. 132S, room 1784	23 10:00 AM Time cards 5:30 PM Evalena @ 5:30	24
25	26	27 10:30 AM Patent Priority Mtg. - Bert Weis	28 8:00 AM Kathy Raymond - Vacation Day			

March 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 1:30 PM Staff Meeting @ here	2 10:00 AM Time cards 4:00 PM Appt to take car in Monday	3
4	5 7:30 AM Appt. Mercedes Benz Plesanton @ 7:30 am	6	7	8 3:30 PM Ron Frank re: IL-10540 @ Patent Conf. Rm.	9 10:00 AM Time cards	10
11	12 3:30 PM Deep Sea Chemical Experiments - Peter Brewer @ Bldg. 123	13	14 10:30 AM Rod & Ann at 10:30 am @ Conf. Rm Here 5:30 PM Appt. Evalena	15	16 10:00 AM Time cards	17
18	19 10:15 AM Business Tutorial @ T-6928 conf. rm. 11:45 AM Meeting Off Site	20 9:30 AM Morrison & Foerster FESTO Briefing @ Palo Alto	21	22	23 10:00 AM Time cards	24
25	26	27 10:30 AM Patent Priority Meeting	28	29 8:00 AM sick 5:30 PM Personal - 5:30 PM in Danville	30 10:00 AM Time cards	31

April 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 10:30 AM U of W President's Brunch	2	3	4	5 2:00 PM IPAC Physics and Applied Technolgies (Laser) 2:30 PM Staff Meeting	6 10:00 AM Time cards	7
8	9 5:30 PM Personal Appointment at 5:30	10	11 2:00 PM Meeting with Gary Johnson & Tony Ruggiero	12	13 10:00 AM Time cards 12:00 PM Appt. in Pleasanton at 12:15 5:00 PM Appointment after work 6:00 PM Reminder - Security Briefing Tuesday at 8:15 am	14
15	16 8:00 AM Spring Holiday HOLIDAY 9:30 AM Spring Holiday HOLIDAY 12:00 PM Spring Holiday HOLIDAY	17 8:15 AM Bld. 274,Security Briefing @ Bld 274, Room 1020 Large Conference Room	18 10:30 AM Staff Meeting	19 3:00 PM Appointment Offsite 5:00 PM Society of California Pioneers New Members 5:30 PM Tomorrow Drop Off Car at Mercedez Benz of Pleasanton	20 7:30 AM Drop Off Car at Mercedez Benz of Pleasanton 10:00 AM Time cards	21
22	23 12:00 PM Secretary's Day Lunch	24 10:30 AM Patent Priority Mtg. - Bert Weis 10:30 AM Patent Priority Meeting	25	26	27 8:00 AM Time cards	28
29	30 2:30 PM "Adaptive Optics: A 30-Year Personal Perspective" by David L. Fried Information Science & Technology Program, takes place in Bldg. 219, room 163 @ Bldg. 219, room 163					

May 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 8:30 AM CCIT meeting @ Bldg. 123 Conf. Rm.	2 8:30 AM At Sc[i]3 Patents and Trademarks - Sunnyvale, CA 8:30 AM until 12:00 Noon @ 465 S. Mathlida Ave., Sunnyvale, CA 2:00 PM Staff Meeting	3 11:00 AM Meeting in Walnut Creek	4 10:00 AM Time cards 6:30 PM 6:30 Appointment	5
6	7	8	9 3:45 PM Eugene Spafford, professor of computer sciences and philosophy at Purdue University @ Bldg. 543 auditorium	10 10:00 AM Center for Global Security Research "Developments in Russian Nuclear Policy" by Nikolai Sokov, @ Bldg. 132, South CGSR conference room 1781	11 9:00 AM Time cards 10:00 AM Jan and Patent Attys	12
13	14 5:30 PM Josef Bockhorni	15 8:30 AM Business Workshop Planning @ T-6925, rm. 1110	16 9:00 AM Meeting-Toni @ Library 1:00 PM Meeting Off-Site	17	18 8:15 AM Staff Meeting 12:00 PM Time cards	19
20	21	22	23	24	25 10:00 AM Time cards	26
27	28 8:00 AM Memorial Day HOLIDAY	29 10:00 AM Patent Priority Meeting @ Patent Conference Room	30	31		

June 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 10:00 AM Staff Meeting 4:00 PM Time cards	2
3	4	5 11:30 AM pick up by Black Tie Limo at So. Gate 12:45 PM TRAVEL 3:45 PM TPWG Meeting, Chicago	6 8:00 AM TECHNOLOGY PARTNERING 2001 - Argonne Lab @ Chicago	7 8:00 AM TECHNOLOGY PARTNERING 2001 - Argonne Lab 5:15 PM Return to So. Gate	8 10:00 AM Time cards	9
10	11 8:00 AM hartwi@sandia.gov> You are on. Let me know when you are free. 2:00 PM Center for Global Security Amy Myers @ Bldg. 132S, Room 1781	12 10:00 AM Jim Holst and John Lundberg of the General Counsel's Office at the University of California @ T5627, R 1034 3:00 PM Bala Swamy Interview @ T-6925, conf rm	13	14 9:00 AM Jay Ayers at 9:00 AM @ Bldg 2775, Room 1009 (West Wing)	15 10:00 AM Time cards	16
17	18	19 5:30 PM Appointment with Darren	20	21 10:00 AM TID OPEN HOUSE June 21 from 10 to 3. @ in Building 551W 3:15 PM Time cards	22 8:00 AM VACATION DAY	23 11:30 AM Society of Cal. Pioneers 11:30 - 2:30 @ Menlo College
24	25 8:00 AM Time cards	26 8:00 AM Vacation Day	27 8:00 AM ON TRAVEL - Travel to Los Alamos 4:00 PM Working Dinner - Los Alamos	28 8:15 AM ON TRAVEL - Los Alamos	29 8:15 AM ON TRAVEL - Albuquerque 12:45 PM ON TRAVEL - Return to California	30

ATTACHMENT A

LAWRENCE LIVERMORE NATIONAL LABORATORY
P.O. Box 808, Livermore, California 94550

LLNL File No.
IL- 9928

Disclosure and Record of Invention

This invention was made in the course of or under prime Contract No. W-7405-ENG-48 between the U.S. Department of Energy and the University of California. This Disclosure and Record of Invention is prepared for the Office of the Assistant General Counsel for Patents, U.S. Department of Energy.

I. Title of Invention:
Integrated Optical Capillary Electrophoresis Chemical Microsensor

Payroll Account No / Department/Division:
9840 J-Division / NAI

II. Inventor(s):

(First, Middle, Last)	Title/Position	Employer	Phone No.	Fax No.	Mail Stop
Anthony , J., Ruggiero	Physical Chemist	LLNL	3-1020	2-4544	L-183

III. Abstract

This invention is a palm size chemical micro-sensor module that has detection sensitivities in the sub-ppm range and is constructed using a unique combination of integrated optical and planar chip micro-fabrication techniques. A chemical analysis instrument on a chip, this sensor will separate and identify components of complex mixtures using capillary electrophoresis (CE) and a novel universal optical detection system. The detection system is based on two beam interferometry using integrated optical wave guide structures in a Mach-Zehnder interferometer geometry. It can be configured to detect chemical species separated by CE by measurement of either direct refractive index (RI) changes due to the analyte, or photo-induced RI changes resulting from analyte absorption. The latter changes can be either photo-thermal in nature or result from polarizability differences between ground and excited states of the analyte. Designed for minimum size and a low prime power requirement, this device will be suitable for use as an operator controlled field instrument or as an unattended sensor on a wide variety of platforms (e.g., on UAV's or in unattended ground sensor systems).

IV. List past uses, current uses and potential uses for your invention:
LLNL or Government uses or possibilities for use:

Rapid, automated trace chemical analysis and in-situ identification of aqueous effluents, extracts or condensates associated with the development , production or handling of weapons of mass destruction (WMD). Battlefield detection of biological and chemical warfare agents

Commercial, or other uses or possibilities for use:

Applications of this technology include environmental monitoring, forensics science, pharmacological and medical sample analysis and industrial chemical process monitoring.

V. Documents, publications and presentations, describing the invention, that you have published or prepared for publication, or presented on the subject. Also, include presentations and publications planned within one year from now:

Title/Subject	Date	Publication No.
Ultrasensitive Compact Integrated Optic Sensors for Trace Analysis of Complex Aqueous Mixtures, FY94 Advanced Concepts Proposal and Pres.	11/2/93 LLNL	
Presentations to DOE NN-20 Officials atLLNL	11/17/94,4/12/95,6/27/95	
	1/8/96, 2/26/96	
Optoelectronic Sensors at LLNL,, DOD Photonics Conference	3/26/96	
Mclean VA ,		

All presentations and documents to date have been for Official Use Only See attached note

VI. Related Documents, (Including patents, other publications): Please include: Patent No.'s, Authors, Title, Publication Date, etc.
none

VII. DESCRIPTION:

Background of the invention, including technical problems addressed by it:

See attached documents. Currently the primary limitation to the widespread use of capillary electrophoresis (CE) for trace field analysis is the lack of suitable low-sample volume (nanoliter-picoliter) optical detectors. Consequently, the high separation resolution delivered by CE is often lost at the detection stage. The most sensitive optical techniques currently in use are based on laser induced fluorescence and are limited to fluorescent molecules or molecules that can be easily derivitized with the appropriate fluorophore. This limitation often precludes the use of CE for ultrasensitive field deployable sensors. Work on universal CE detectors (detectors that respond to virtually all compounds) is currently a major topic of research. DOE NN-20 Advanced Concepts research in FY94 and FY95 explored the fundamental measurement physics, feasibility and general performance issues involved in the design of a novel all solid state field deployable ultra-sensitive universal CE detector/chemical sensor system . The device is based on two beam interferometry in compact fiber coupled integrated optic (IO) Mach-Zender waveguides. In this type of sensor, the optical phase of the light passing through the device is modulated by a change in absorption induced refractive index in the CE capillary caused by the chemical species to be detected. The phase modulation is then measured interferometrically by comparing the phase of the light in the CE sample arm to the reference arm. The key feature that separates this approach from other thermo-optical and interferometric based CE detection approaches is the use of *close coupled CE/IO device architecture's*. This sensor has a number of attractive features. Optical phase information is demodulated, by detection of all the light emerging from the interferometer rather than a spatially selected component or fringe. Consequently, the signal is independent of thermal lensing artifacts due to the spatial distribution of the excitation beam and is also much less sensitive to misalignment than conventional fringe shift techniques. The system is also well suited to both active and passive homodyne stabilization techniques that would be required for field deployment. Other advantages include, wide dynamic range, high sensitivity, low overall energy budget and the potential for device multiplexing for decreased analysis time and/or improved species identification. Recently, advances in CE miniaturization have resulted in the development of entire CE systems including electrokinetic sample injectors on palm sized glass "chips". This type of planarized chip technology is ideal for interfacing with IOCE detection systems described above. As a result of the Joule heating accompanying electrophoresis, thermal management is a crucial parameter in determining both efficiency and resolution in CE separations. At LLNL, we have developed and tested a micro-fabrication strategy for electrokinetically injected planarized CE systems on advanced ceramic substrates. Average size of some of the prototype devices allows them to be placed on top of a US quarter. Choice of CE chip substrate material used in microfabrication provides a yet untapped parameter for CE system optimization. Thermal conductivity of the CE chip substrate can easily be increased one to two orders of magnitude over conventional fused silica and glass based systems. Specifically , the use of sapphire, diamond or CVD diamond would be optimal. With regard to an IOCE type detector /sensor system this should translate to increased system response time and decreased analysis time. New CE chip substrate materials also permit optimization of crucial solute/capillary wall interactions via choice of inherent substrate surface charge states.

Summary of the Invention (you may attach a paper). Please include a sketch of the invention, if possible:

See attached documents

PROPRIETARY INFORMATION FOR INTERNAL LLNL USE ONLY

VIII. Inventor's Permanent Home Address(es):

Name	Citizenship	Street Address	City, State, and Zip Code
Anthony J. Ruggiero	USA	1251 Murdell Lane	Livermore, CA 94550

Please attach a separate sheet for additional inventors.

IX. Funding Source or Project Under Which the Invention Arose: Please include subcontracts or special project information.
DOE NN-20 Advanced Concepts Program

Resource Manager: Jim Caselli Phone No.: 422-9055

B&R No.: GC0101093 LLNL Account No.: 5382-50 Subcontract No.: ______ (if applicable)
DOE Program Code: ST043D

Is funding presently being provided for development of your invention: Yes: X No: ____
Please state the source of funds: (if same as above, please so state)
same as above

Do you reasonably expect future funding from the current source or other sources: Yes: X No: ____
If yes, what is that source DOE NN-20 Office of Research and Development

X. Conception (Date, Place): 7/10/93 at LLNL
Conception Date Conception Place

Earliest documentation of your invention: (please provide date and identify the document)

First Sketch or Drawing: 11/2/93
First Written Description: 11/2/93

Names of witnesses or others with knowledge of facts relating to conception:

Full Name	Organization	Telephone Number
Albert J. Ramponi	LLNL / J-Division/ NAI	423-3363
David H. Dye	LLNL / NAI	422-5036

XI. Reduction to Practice:

Date first model completed: July 1994
Date of operation and testing: July 1994
Place of test: LLNL
Results of testing: Demonstrated general feasibility of detection concept

Witnesses or others with direct knowledge of test:

Full Name	Organization	Telephone Number
Albert J. Ramponi	LLNL J-Div / NAI	423-3363
Mike Staggs	LLNL ERD	422-3682

I(We) believe myself(ourselves) to be the first and original inventor(s) of the above-described invention:

INVENTOR: Anthony J. Ruggiero DATE: 3/23/96
WITNESS: A. Ramponi DATE: 23 March 1996
INVENTOR: ______ DATE: ______
WITNESS: ______ DATE: ______
INVENTOR: ______ DATE: ______
WITNESS: ______ DATE: ______

LLNL File No.: IL- 9928

CLASSIFICATION REVIEW MUST BE COMPLETED FOR ALL UNCLASSIFIED DISCLOSURES

Basis for unclassified release:

X Outside scope of AEA and EO

__ CG-DAR-1, Topic(s) ____

__ Other Guide(s) ____

Topic(s) ____

UCNI: X NO __ YES, guide ____

Authorized Derivative Classifier:

Albert J. Ramponi
Name

J-Division Group Leader
Title

A. Ramponi
Signature

Confirming Reviewer:

Iven Moen
Name

Iven Moen 3/26/96
Signature

FOR LLNL PATENT GROUP USE ONLY

Possible Statutory Bars:

Publication:

Public Use/Sale:

Recommended Filing Date Due to Possible Statutory Bars:

READ AND UNDERSTOOD BY:

LLNL PATENT ADVISOR

4/4/96
DATE

TL-9928

3/21/96

Regarding documents, publications and presentations, describing the invention, that you have published or prepared for publication, or presented on the subject. Also, include presentations and publications planned within one year from now:

All presentations, briefings and written documents to date involving this invention have been to DOE NN-20 sponsors or goverment agencies and were for official use only. The following publications/presentations are planned in the immediate future

Mark Lowry and Anthony Ruggiero, "Optoelectronic Sensors at LLNL" ,,DOD Photonics Conference. **3/26/96**
Mclean VA ,

Anthony Ruggiero and Micheal Staggs , "Laser Beam Coupling to Micro-Capillary Tubes", in preparation for submission to Analytical Chem Lett. in late summer 1996.

Anthony Ruggiero and Micheal Staggs ,"Universal CE Detection Using Two Beam Interferometry", in preparation for submission to Analytical Chemistry in late summer 1996.

Advanced Concepts Program

—Ultrasensitive compact integrated optic sensors for trace analysis of complex mixtures —

Principal Investigator: Anthony J. Ruggiero

J-Division
Lawrence Livermore National Laboratory

June 27, 1995

We are developing a unique field deployable microsensor for trace analysis of aqueous mixtures

- the sensor system incorporates:
  - — micro-analytical chemical separation via Capillary Electrophoresis
  - — "universal" detection by two beam interferometry using integrated optic technology
- target application: trace component analysis of waste water, condensates, and leachates associated with refining, processing and reprocessing of nuclear materials
- additional applications:
  - — analysis of CW and BW agents and associated chemicals
  - — pharmo-kinetic and metobolic sensors
  - — industrial chemical and biochemical process control monitoring
  - — environmental monitoring

Desired microsensor characteristics

- high detection sensitivity
- large dynamic range
- low sample volume requirements
- compact, lightweight, rugged, and reliable
- low energy budget (power consumption)
- rapid automated sample handling and real time analysis
- level of automation suitable for unattended operation or RPV

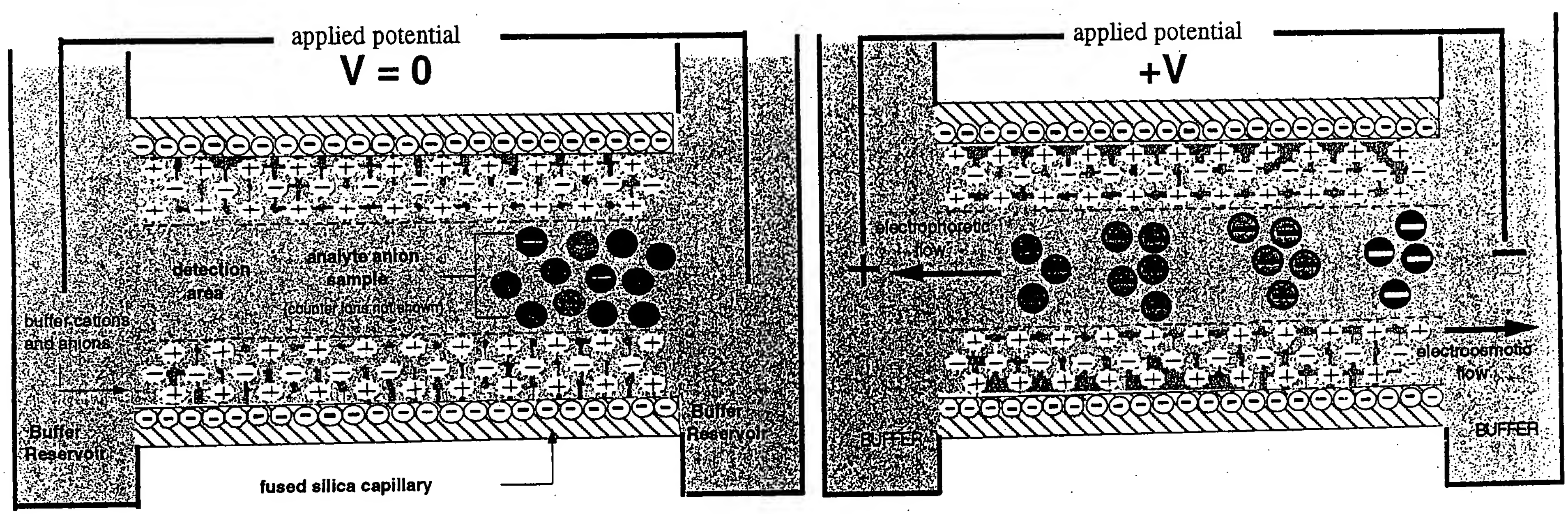
Integrated electro-optical components are well suited to sensor applications

- IO components are the optical counterpart to integrated electronics
- light signals are controlled and manipulated electronically within miniaturized waveguides made on a common substrate
- waveguide structures confine, guide and provide a propogation path for the light
  - alignment and mechanical sensitivity issues are minimized
    - low optical loss
    - no moving parts involved in beam manipulation and modulation
  - low drive voltage requirements
  - compact and modular packaging
    - multiple optical components can be combined on a single chip
    - multiple sensor chips can be multiplexed

Capillary electrophoresis is a calibrated micro-analytical chromatographic technique

In CE, sample ions in an applied field differentially migrate and are detected at characteristic transit times.

(1) t = 0, sample injected into capillary **(2) t = t1, sample component 1 detected**



CE combines the strengths of both HPLC and conventional electrophoresis

- capable of operation in aqueous media (most forms of liquid chromotography require non-aqueous solvents)
- small sample volumes (nanoliters to picoliters)
- resolution is independent of column length
- ideal choice for trace analysis of
  - — inorganic ions, small organic molecules
  - — organic acids, water soluble polymers
  - — biomolecules (protiens, peptides, neorotransmitters, DNA etc.
- micro-machined CE systems with integrated sample injection have been fabricated on silicon and glass and is currently an area of active research

Widespread use of CE for trace analysis in field deployable sensors is limited by detection technology

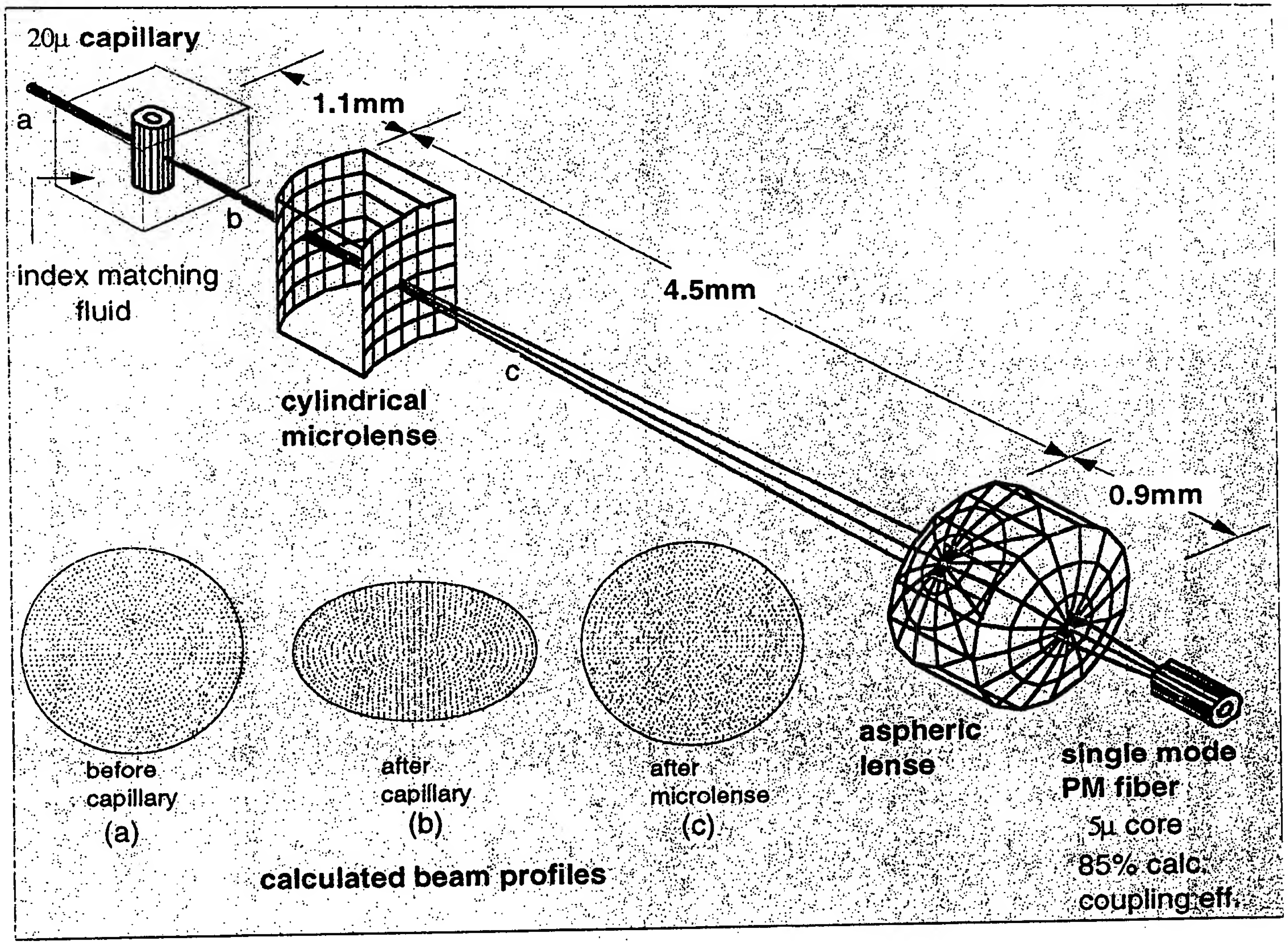
- suitable low sample volume (nanoliter to picoliter) optical detectors for micro-analytical fluid phase techniques such as CE are an active area of research

- laser induced fluorescence is currently the most sensitive optical technique in use
  - limited to fluorescent molecules with large quantum yields
  - molecules that can be easily derivitized with the appropriate chromophore
  - many naturally fluorescent chromophores are quenched in water

Combining CE and integrated optical interferometry offers several advantages for chemical sensing

- incorporation of a separation step in a sensor system dramatically reduces selectivity requirements
- electric field driven separation based techniques like CE are:
  - rapid
  - exhibit excellent resolution performance
  - well suited to miniaturization, microsampling and automation
- optical phase shift measurements are extremely sensative and can be used as "universal" detectors
- well developed IO micro-fabrication techniques make possible
  - increased on chip functionallity
  - low power consumption and ease of packaging
- IO components are already established as reliable , rugged and field proven
  - temperature stable
  - impact resistant

Computer modeling was used to design a cylindrical microlense to correct for systematic optical aberations

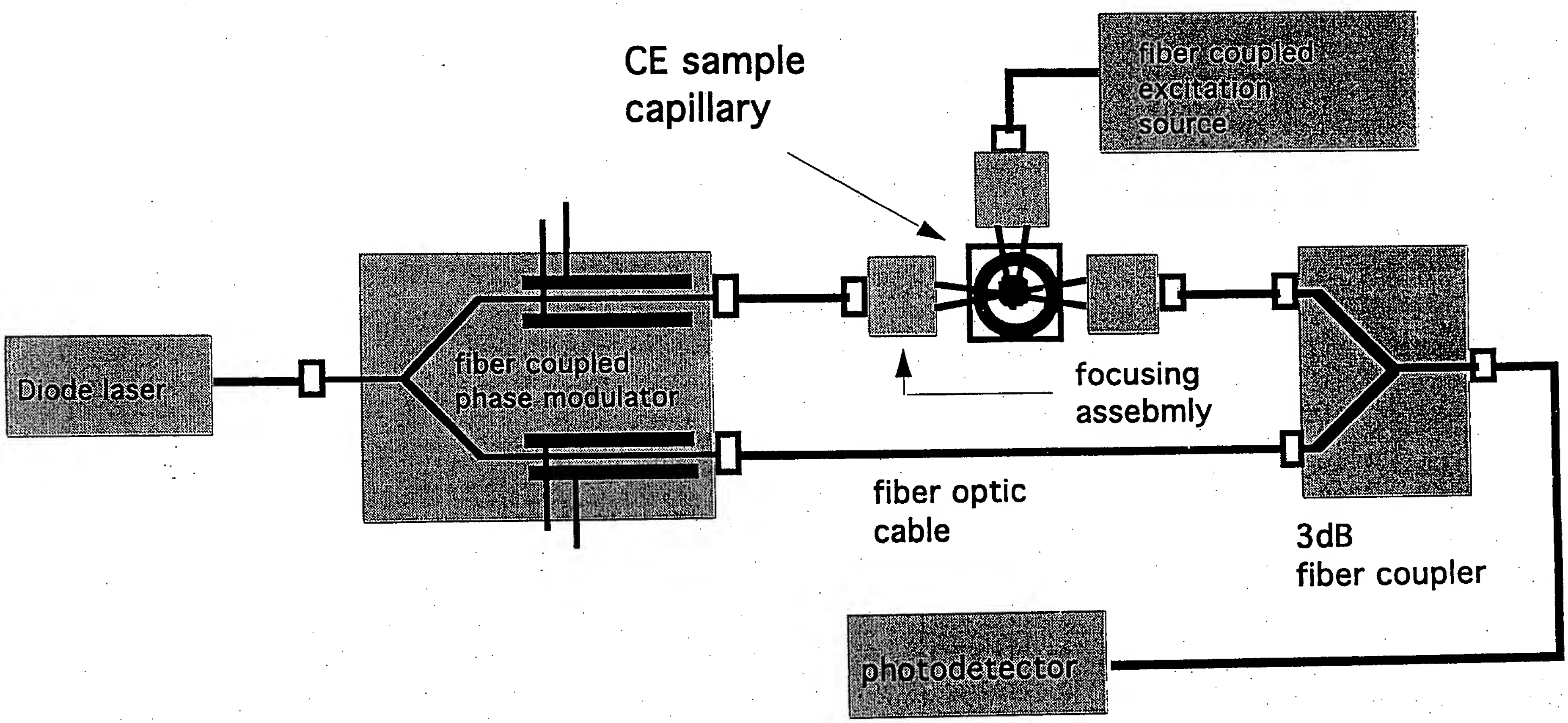


The IOCE sensor can be configured in two detection formats based on optical phase shift measurements

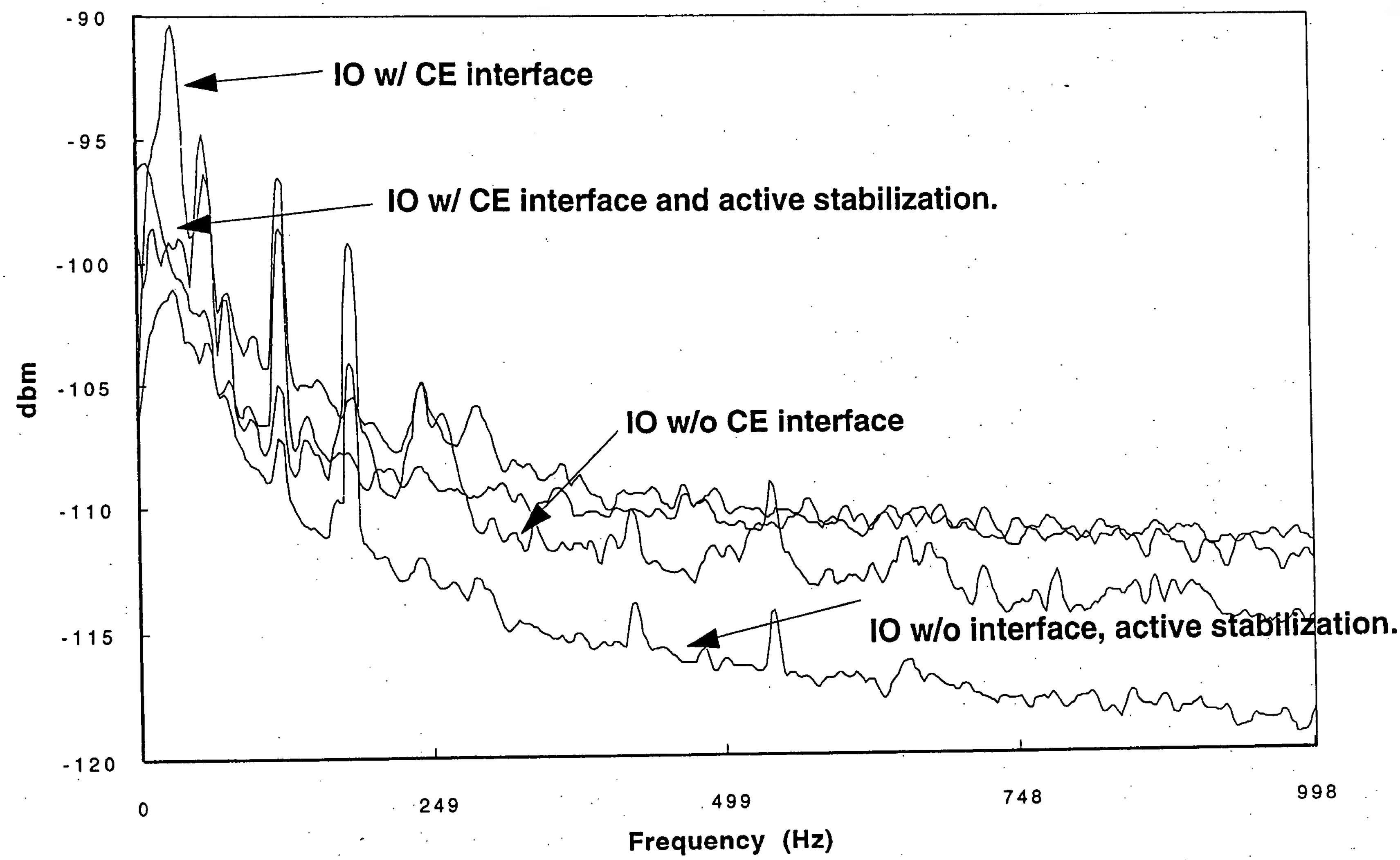
- direct refractive index (RI) measurements based on modulation techniques

- photoinduced RI measurements
  - photo-thermal detection
    - absorption by resonant optical excitation induces a refractive index change by local heating of the sample excitation volume
    - the refractive index change is detected by the nonresonant MZ probe beam
  - laser induced RI detection * (new technique under development)
    - absorption by resonant optical excitation induces a refractive index change of the sample excitation volume via the excited state polarizability
    - the refractive index change is detected by the nonresonant MZ probe beam

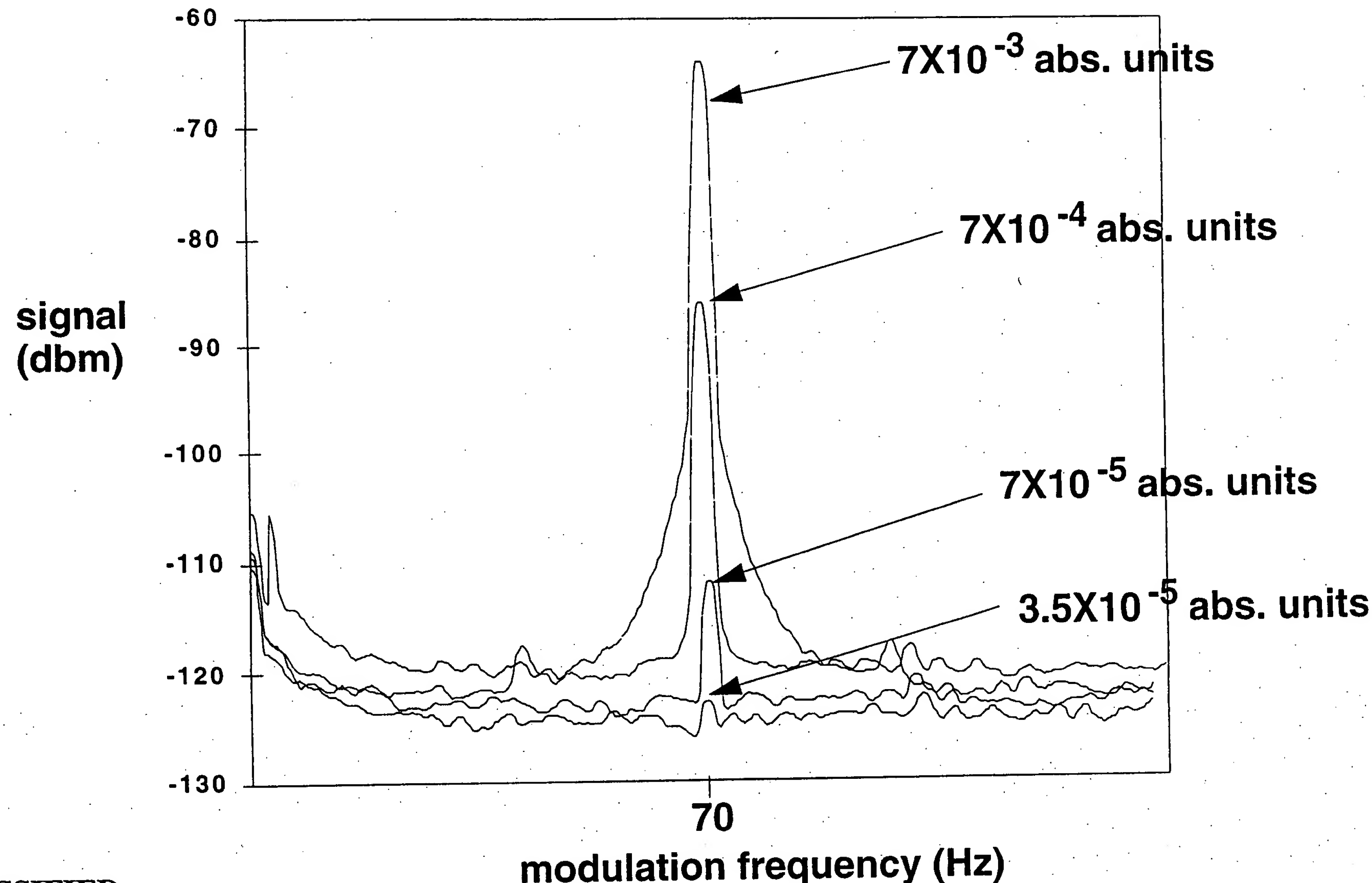
Schematic of discrete component IOCE prototype for Phase I feasibility studies



Spectral noise analysis of the Phase I discrete component system prototype



Signal spectra of thermo-optical absorbance measurements made on fluorescene/water samples



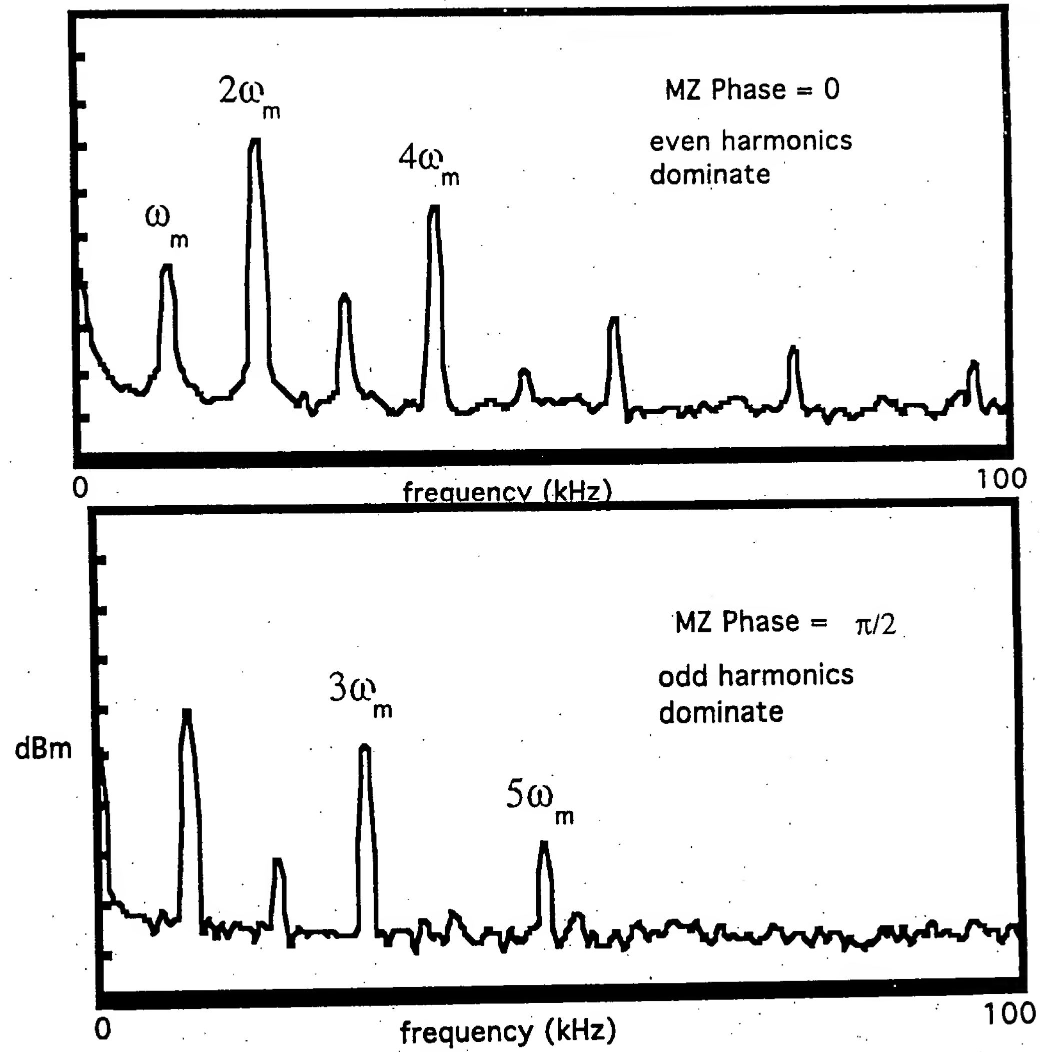
Comparison with competing absorbance detection technologies* for a 20μ pathlength in abs. units

- universal detection approaches demonstrated in chromatographic applications include:
  - — direct absorption - $5X10^{-2}$
  - — thermal lense detection - $4X10^{-4}$
  - — Fabry-Perot RI detection - $4X10^{-5}$
  - — laser intracavity absorption - $5X10^{-5}$
  - — photoacoustic detection - $1.2X10^{-5}$
- theoretical sensitiviy limit for the IOCE approach is calculated to be on the order of $5X10^{-8}$.
- Absorbances in the 10^{-5} - 10^{-6} range have been detected with protoype IOCE devices in our laboratory
- many of the above techniques
  - — are not easily configured into miniature, rugged fieldable sensors
  - — general use is restricted by experimental complexity

* adapted from E. Young, "Laser Spectroscopy for Detection in Chromatography" in <u>Analytical Applications of Lasers</u>

Both passive and active techniques are possible for stabilization and improved S/N via phase modulation

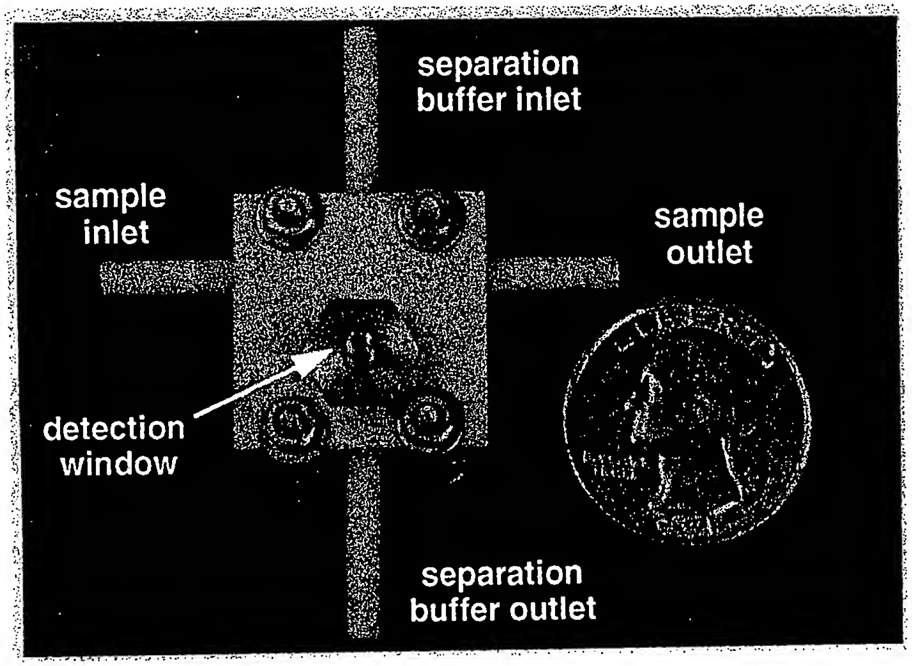
signals composed of both in-phase and quadrature components can be generated that eliminate signal fading problems associated with thermal and mechanical drift

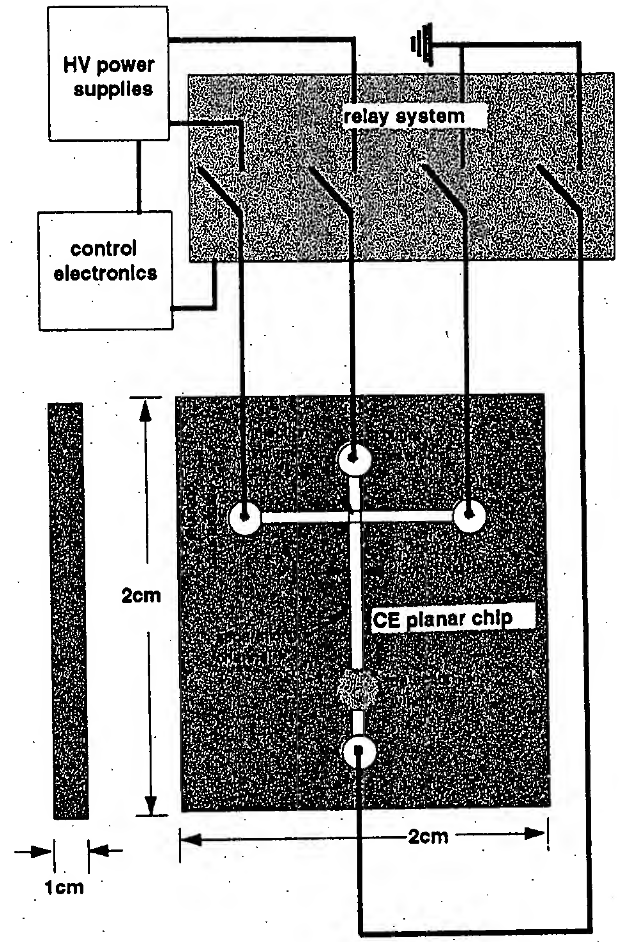


Thermal management and surface charge are crucial parameters in determining CE efficiency and resolution

- Joule heating accompanying electrophoresis
  - — affects separation resolution
  - — analysis time by defining operating voltages
- surface charge effects separation efficiency through solute wall interactions
- the thermodynamics of the system also determins detection response time for thermo-optical based measurements

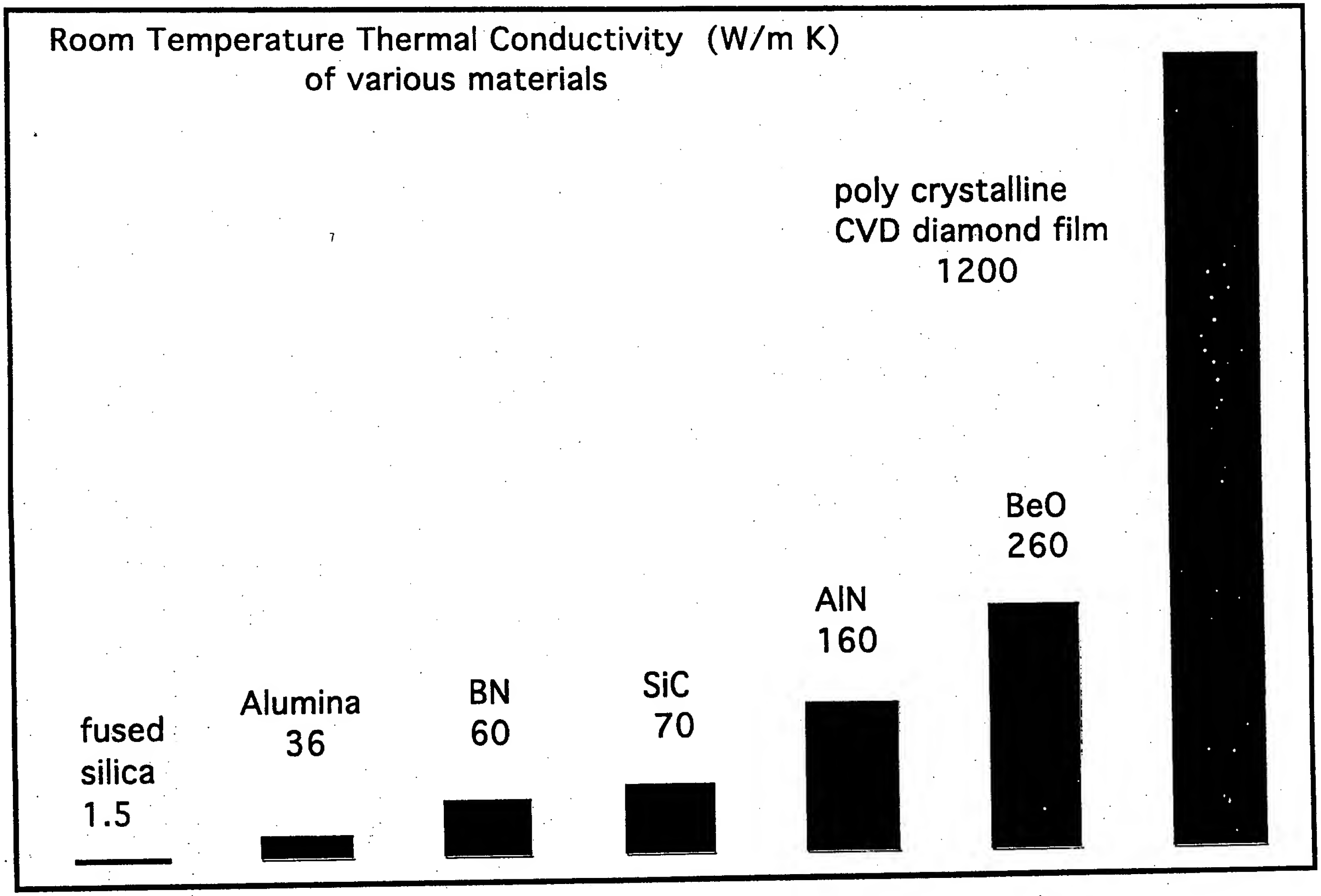
LLNL ceramic planar chip CE prototype with electro-kinetic sample injection





CE system schematic

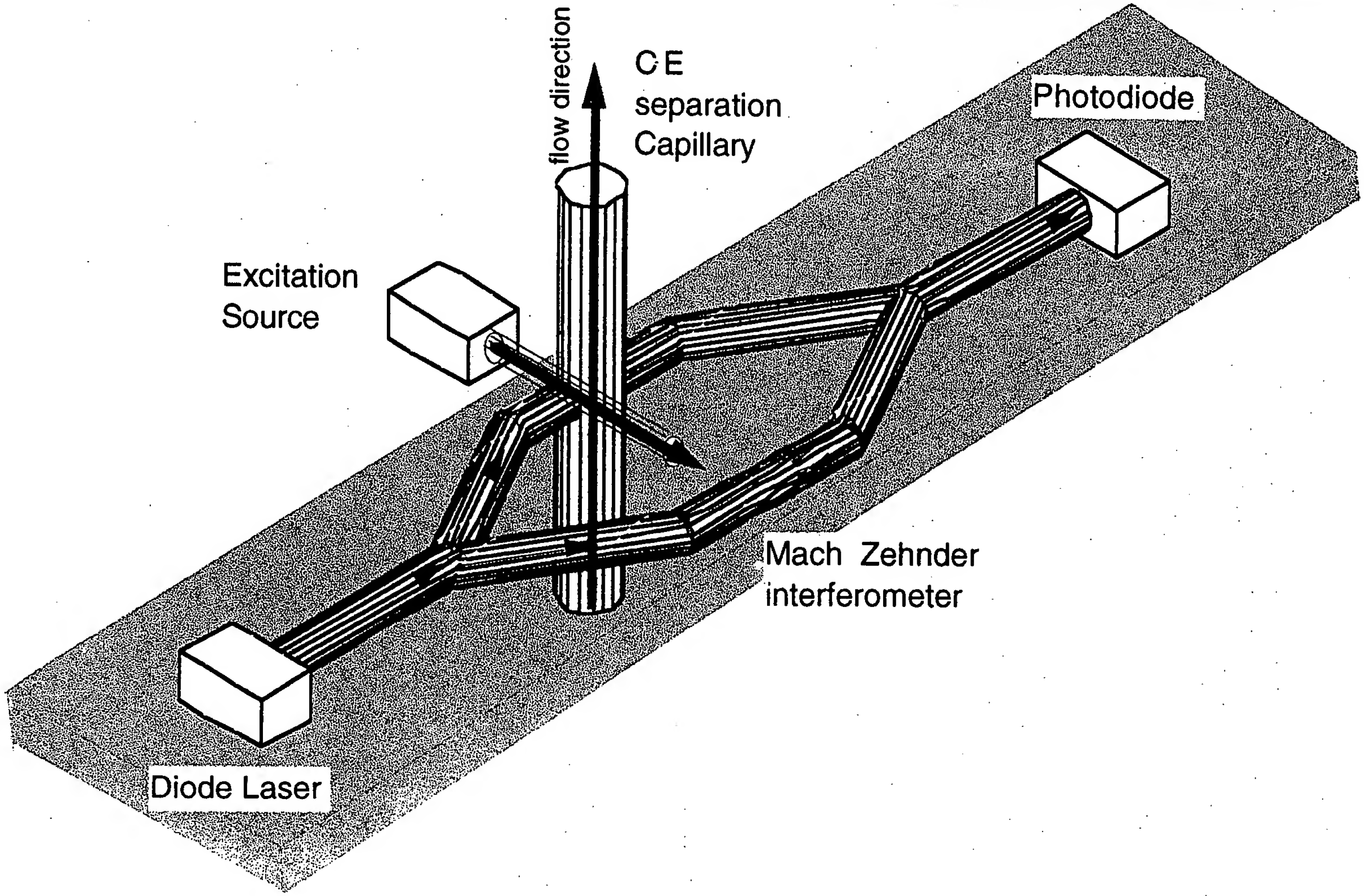
Choice of CE chip substrate material provides a yet untapped parameter for CE system optimization



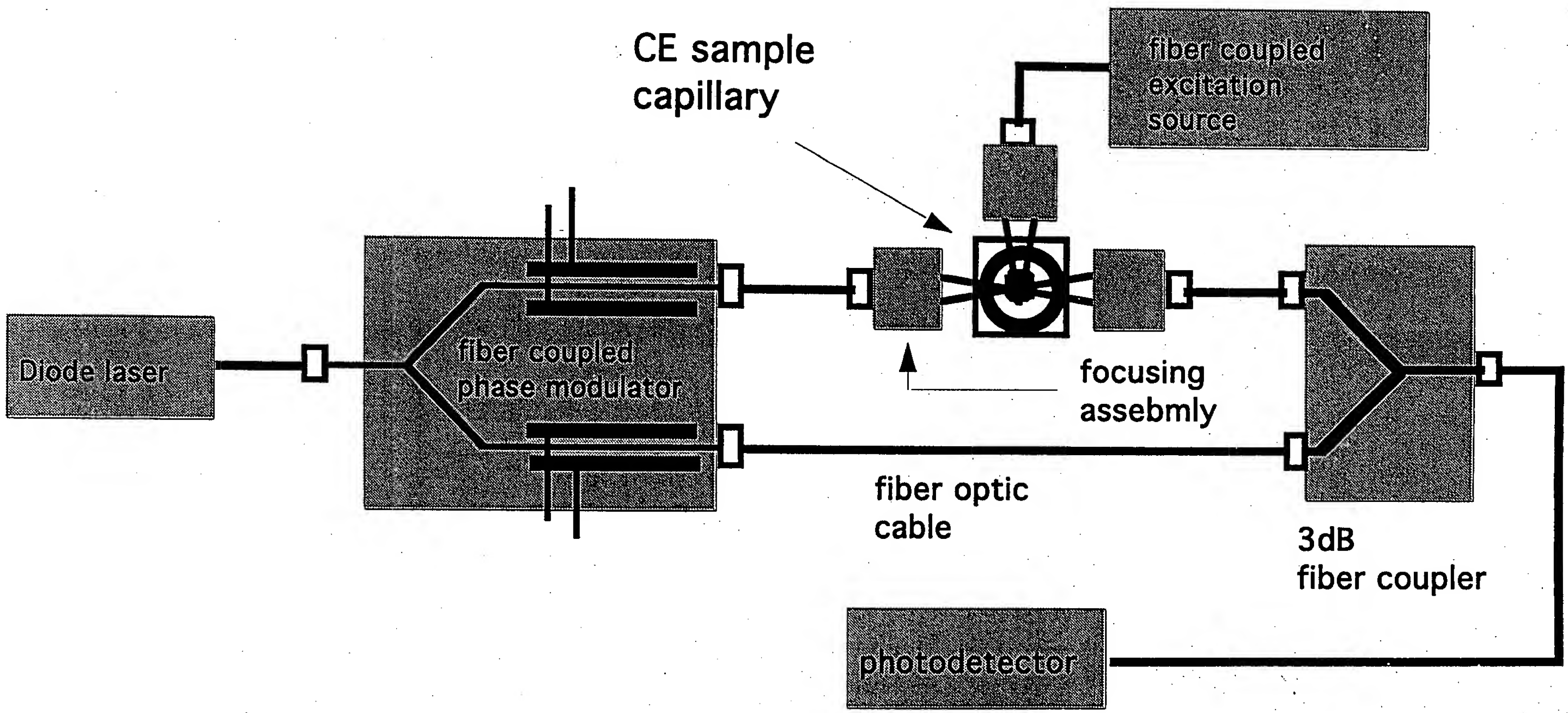
Summary

- a novel IO based detection scheme suitable for a field deployable sensor has been conceptually developed and initial feasibility has been established
- microlense technology has been developed to correct for beam aberations induced at the IO/CE interface, verifying our ability to efficiently couple high quality laser beams from the CE capillary to the IO components
- a prototype IOCE device has been fabricated from discrete components and tested
- preliminary feasibility tests using active stabilization and phase modulation of the IOCE system have been accomplished
- final testing and evaluation of the Phase I demonstration prototype detection sensitivity is currently underway
- a micro-fabrication strategy for a electro-kinetically injected planarized CE system has been developed and tested
- a phase II sensor prototype incorporating IO components with greater on chip functionality and a planar chip CE system has been designed and is under construction

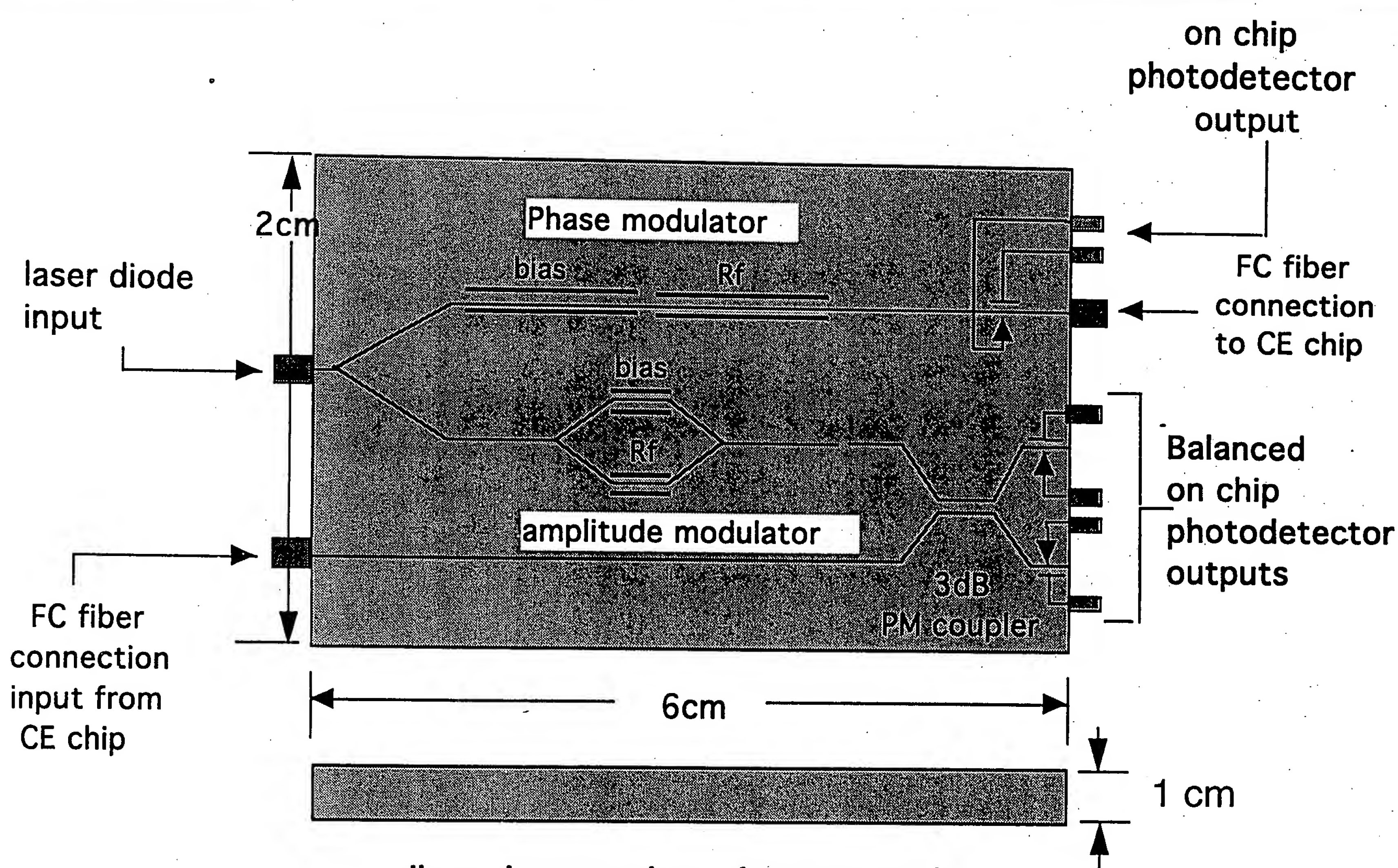
Conceptual diagram of the integrated optic capillary electrophoresis (IOCE) chemical sensor module



Schematic of discrete component IOCE prototype for Phase I feasibility studies

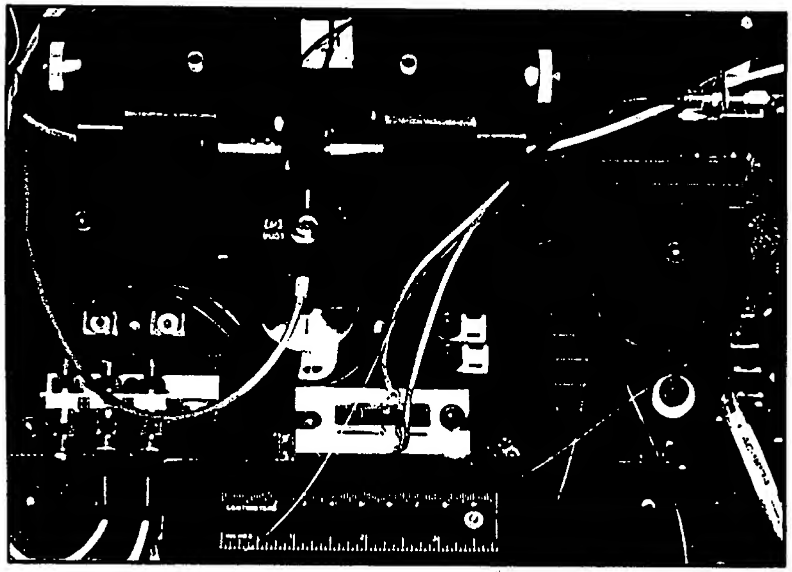


Phase II prototype IO device schematic

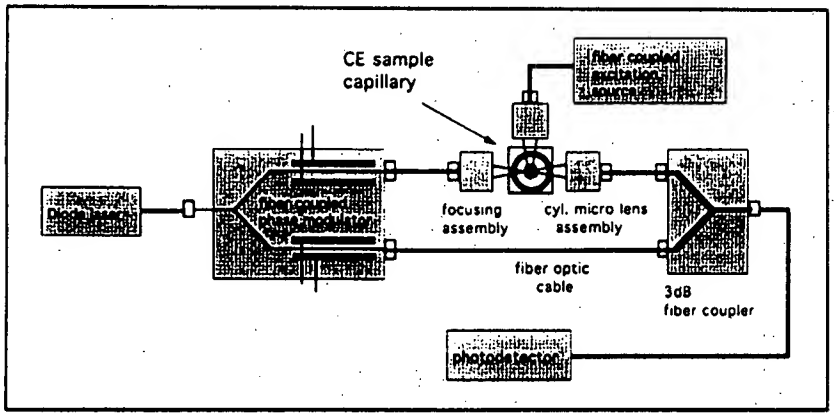


dimensions are shown for connectorized laboratory prototype package

INTEGRATED OPTIC MICROSENSORS FOR TRACE ANALYSIS OF COMPLEX AQUEOUS MIXTURES



Phase 1 discrete component prototype



Schematic of discrete component IOCE prototype

DESCRIPTION:

- Chemical microsensor system employing capillary electrophoresis and unique integrated optic detection technology
- Compact, low energy budget, nanoliter-picoliter sample volumes
- Rapid automated microsampling and real-time analysis

APPLICATION:

- Trace component analysis of waste water, condensates, and leachates associated with refining, processing and reprocessing of nuclear material
- On-site inspections, unattended monitoring or use in remotely piloted vehicles

SPONSOR:
U.S. Department of Energy, NN-20

DEVELOPER:
Lawrence Livermore National Laboratory

17-T/1124-01

A-9938

INTEGRATED OPTIC CAPILLARY ELECTROPHORESIS MICROSENSOR

FY97-FY99 LIFECYCLE PLAN PROPOSAL

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CO-INVESTIGATOR:	**FRANK PATTERSON** LLNL, PHY. DEP. , PHOTONICS GROUP, PHYSICS AND SPACE TECHNOLOGY
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FUNDING START DATE: **10/1/97**
FUNDING COMPLETION DATE: **10/1/99**

FUNDING

		OPERATING $	CAPITAL $
FY	1997	1480K	150K
FY	1998	1800K	50K
FY	1999	1200K	50K

PROJECT DESCRIPTION:

Based on the results of a recent NN-20 Advanced Concept project, a field deployable chemical microsensor module will be developed for rapid, automated trace analysis and in-situ identification of aqueous effluents, extracts or condensates associated with the development , production or handling of weapons of mass destruction (WMD). The palm size sensor module will have detection sensitivities in the sub-ppm range and will be constructed using a unique combination of integrated optical and planar chip micro-fabrication techniques. A chemical analysis instrument on a chip, this sensor will separate and identify components of complex mixtures using capillary electrophoresis and a novel universal optical detection system.

There are no requirements for volatile, thermally stable compounds or derivitives as in gas chromotography (GC). Aqueous samples containing complex chemical species with a wide polarity range can be analyzed in a single run directly from a crude field sample after a simple filtration. Unlike most forms of high performance liquid chromatography (HPLC) that share this advantage, however, large volumes of non-aqueous solvents are not required. Designed for minimum size and a low prime power requirement, this device will be suitable for use as an operator controlled field instrument or as an unattended sensor on a wide variety of platforms (e.g., on UAV's or in unattended ground sensor systems). It will represent the state of the art in fieldable chemical micro-analytical instrumentation.

PROJECT SUPPORTS:

Treaty on the Non-Proliferation of Nuclear Weapons, Chemical Weapons Convention

PROJECT STATEMENT OF WORK

Objective:

The primary project objective is to develop a compact fieldable micro-sensor module that can be used to rapidly isolate, identify, and quantify inorganic or organic cations and anions of interest in water samples, condensates, leachates, or aqueous atmospheric aerosol extracts. The module will be a compact, energy efficient device that can be easily incorporated into a variety of field platforms. It will include a versatile micro-fabricated pre-analysis sample preparation and injection manifold that will enable the system to be easily interfaced to user specified sample collection formats.

Application:

After calibration for the chemical species of interest, the field deployed system will detect and quantify radionuclides and chemical signatures in aqueous effluent samples obtained from facilities that are potentially indicative of weapons of mass destruction (WMD) proliferation activities. Dual use and spin-off applications of this technology include environmental monitoring, forensics science and, pharmacological and medical sample analysis.

Prior Work:

The proposed work is a continuation of a DOE NN-20 Advanced Concept project initiated in FY94 by the P.I. to investigate the feasibility of combining solid state laser and integrated optic (IO) component technology with micromachined planar chip capillary electrophoresis (CE) systems. Prior work emphasized fundamental physics of the IOCE interface and the detection technology, providing optical and thermo-mechanical design tolerances for the system.

Capillary electrophoresis (CE) has been regarded by many in recent years as a major breakthrough in fluid phase separation science.[1] It is now an established and well understood microanalytical technique. CE combines the strengths of both high performance liquid chromatography (HPLC) and conventional electrophoresis to yield rapid, precise, automated, and highly efficient analysis of complex chemical mixtures using minimal injected sample volumes (picoliter-nanoliter, see Figure 1.). Most forms of high performance liquid chromatography require non-aqueous solvents, CE, however, is capable of operation in aqueous media, making it the ideal choice for trace analysis of inorganic ions, small organic molecules, organic acids, water soluble polymers and biomolecules (proteins, peptides, neorotransmitters, DNA etc.). Samples for analysis can be obtained directly in the fluid phase, or as extracts from solids or condensates. Analyte concentration on solid phase chemical or particle filters prior to aqueous extraction and analysis is also possible.

The rapid growth of this analytical technique is due to the inherent simplicity of the required hardware and the fact that the physics of the separation are easily controlled by the choice of electrolyte. In essence, the electrolyte and polarity of the applied voltage programs the capillary to separate anionic, cationic, or neutral species. This is in contrast to established ion analysis techniques, such as ion chromatography, where separations are wholly dependent on dedicated specialized analytical columns. High CE separation efficiencies result from the use of small separation channels or capillaries, 20-100 microns in diameter. Since the efficiency is independent of channel length, the entire approach is extremely amenable to micro-fabrication and miniaturization. In fact, CE performance improves with reduced size.

Chemical sensing systems based on capillary electrophoresis can be *versatile, sensitive and selective*. The detector can be optimized for sensitivity without regard to selectivity, while the electrophoresis separation capillary can be optimized to yield high selectivity toward a particular chemical species or class of chemicals. The system is versatile in the sense that the same system hardware can be used for analysis of a wide variety of different types of chemicals by manipulation of the CE separation conditions. This is in contrast to most chemical sensors in which a tradeoff exists between versatile performance, sensitivity and selectivity.

CE based sensors, with their ability to directly analyze crude aqueous field samples, can offer tremendous advantages in the treaty verification and proliferation detection arenas. For example, identification of precursors and degradation products of chemical warfare agents must often be unambiguously identified from various matrices during the treaty verification process. The degradation (hydrolysis) products, alkyl-substituted organophoshorus acids, are polar, have low volatility and are easily isolated from various matrices by extraction with water. While easily analyzed using CE, these compounds are difficult to identify directly using other analytical techniques, such as gas chromatography (GC), in which chemical derivitization would be required.

Currently the primary limitation to the widespread use of CE for trace analysis is the lack of suitable low-sample volume (nanoliter-picoliter) optical detectors. Consequently, the high separation resolution delivered by CE is often lost at the detection stage. The most sensitive optical techniques currently in use are based on laser induced fluorescence and are limited to fluorescent molecules or molecules that can be easily derivitized with the appropriate fluorophore. This limitation often precludes the use of CE for rapid ultrasensitive *field deployable* sensors. Notably, laser induced fluorescence cannot be directly applied, in general, to trace analysis of actinides in aqueous solution due to their low fluorescence quantum yields. In addition, radionuclide counting techniques are limited in this application due to the dependence of the detection limit on the observation time and radionuclide lifetime. In capillary electrophoresis, typical peak widths are only several seconds wide and so only a several second observation time is possible without limiting separation efficiency or increasing the total analysis time. Scintillation detectors consequently are not easily optimized for both maximum analysis speed and sensitivity.

Work on universal CE detectors (i.e. detectors that respond to virtually all compounds) is currently a major topic of research. Under Advanced Concepts research in FY94-95, we explored the fundamental measurement physics, feasibility and general performance issues involved in the design of a novel all solid state ultra-sensitive universal CE detector. As illustrated in Figure 2., the device is based on two beam interferometry in a compact fiber coupled integrated optic Mach-Zehnder interferometer (MZI). One arm of the interferometer includes a small section of the CE capillary. Detection of the electrophoretically separated analyte is accomplished by monitoring the optical phase shift that results from refractive index changes in the CE capillary as different chemical species pass through the MZI sample arm. A substantial increase in sensitivity is obtained by including an amplitude modulated excitation beam to generate photo-induced refractive index changes via analyte absorption. Phase modulation resulting from the absorption process is detected by optical heterodyning with the MZI reference arm. Excitation

wavelengths can be chosen to enhance the selectivity of specific analytes or to provide a universal detection capability. Most aqueous solutes have strong broadband absorptions in the UV spectral region.

The key feature that separates this approach from other thermo-optical and interferometric-based CE detection approaches is the use of close coupled CE/IO device architectures and all solid state laser technology. This approach has a number of attractive features. Optical phase information is demodulated, by detection of all the light emerging from the interferometer rather than a spatially selected component or fringe. Consequently, the signal is independent of thermal lensing artifacts due to the spatial distribution of the excitation beam and is also much less sensitive to misalignment than conventional fringe shift techniques. Unlike, photothermal lens (PL) and photothermal deflection (PD) based detection systems, the signal level is not dependent on the distance between the sample and the photodetector. PD and PL techniques typically require sample to detector distances on the order of 1.5m - 0.15m for maximum sensitivity, the integrated optic capillary electrophoresis (IOCE) system, however, is inherently compact with no large optical lever arms and subsequent mechanical stability requirements.

The system is also well suited to both active or passive homodyne stabilization techniques that would be necessary for actual field deployment, as well as programmable multiple modulation based detection schemes for removal of background absorptions. Other potential advantages include, wide dynamic range, high sensitivity, and low overall energy budget. Results from our FY94-95 Advanced Concepts effort have established the general feasibility of this approach by: (1) demonstrating our ability to efficiently couple high quality optical beams between buffer filled CE capillaries and waveguide structures, (2) developing an actively stabilized discrete component IOCE system protoype, and (3) demonstrating detection of photo-induced absorption signals in 20 micron water filled fused silica capillaries at detection levels on the order of $2X10^{-7}$ absorbance units.

In the last few years, advances in CE miniaturization have resulted in the development of entire CE systems including electrokinetic sample injectors on palm sized glass "chips".[2,3] This type of planarized chip technology is ideal for interfacing with IOCE detection systems described above. As a result of the Joule heating accompanying electrophoresis, thermal management is a crucial parameter in determining both efficiency and resolution in CE separations. To address this issue, we have developed and tested a micro-fabrication strategy for electrokinetically injected planarized CE systems on advanced high thermal conductivity, nonconductive ceramic substrates. (see Figures 3 and 4.) Although these devices are more difficult to fabricate than the conventional glass packages they promise substantially higher performance. Average size of some of the prototype devices allows them to be placed on top of a US quarter.

Choice of CE chip substrate material used in microfabrication provides a yet untapped parameter for CE system optimization. Thermal conductivity of the CE chip substrate can easily be increased one to two orders of magnitude over conventional fused silica and glass based systems. For an IOCE-type detector system this should translate to increased system response time and decreased analysis time. New CE chip substrate materials also permit optimization of crucial solute/capillary wall interactions via choice of inherent substrate surface charge states. The final phase of our IOCE Advanced Concepts work for FY96 will further develop and characterize the IOCE detection technology and integrate it with the ceramic planar chip CE devices into a full phase II prototype sensor. This phase II prototype will provide the relevant design criteria and engineering tolerances for the sensor module proposed here.

Collaborators: Initial collaborations will be concerned with optimizing the planar chip CE system performance, automated sample preparation and dual use applications. Possible collaborators include CE researchers, Dr. Richard Chadwick (Analytical Chemistry R&D Division, Alergan Optical), Professor Warner Kuhr (UC Riverside), Dr

T.R. Wang (Applied Research and Advanced Development Division, Beckman Instruments). As the IOCE technology reaches maturity and is ready for final testing, collaborations with researchers at LLNL and other DOE laboratories that have been involved in identifying proliferation signatures found in aqueous effluents and/or developing chemical analysis protocols for these signatures based on CE is anticipated.

Work for others: None

Proposed Work and Scientific Basis:

We propose the final design, fabrication and testing of a complete chemical micro-sensor module including automated micro-sample injection and prefiltering systems. The sensor system will be based on planar chip capillary electrophoresis, integrated optical detection technology and micro-electro-mechanical sample processing. Using the physical insights and engineering data obtained from our FY94-96 IOCE Advanced Concepts studies, an optimized IOCE sensor module will be developed. Previous Advanced Concepts Phase I and Phase II IOCE sensor prototypes have been designed around commercially available laser and IO components without regard for the minimum obtainable package size or overall system energy efficiency, since the intent of that work was initial demonstration of laboratory feasibility and engineering development. The work proposed here will determine the limits of microfabrication technology and packaging for this type of device and address packaging concerns pertinent to higher levels of subsystem integration. The project will proceed in three phases, (I) baseline, risk reduction, testing and development of enabling microtechnologies, (II) initial sub-system integration and testing, and (III) final microsensor module fabrication and performance demonstrations.

The FY97 effort will be composed of four parallel efforts: high performance substrate planar chip CE design, optimization and testing, fiber coupled UV microchip laser source development, monolithic (single substrate) integrated MZI/laser/ photodetector IO chip fabrication, and prototyping of a microvalve sampling and injection manifold. FY98-99 will comprise final subsystem integration, system electronics packaging and performance testing of the completed chemical microsensor module under simulated field conditions. IOCE microsensor technology makes simultaneous operation of multiple sensor modules either discretely packaged and interfaced or fabricated on a single chip feasible. Advantages and potential applications of this type of multiplexed sensor operation other than simple system redundancy will also be evaluated.

Integrated optical components of the type required for the sensor module and used in our Advanced Concepts prototypes were based on lithium niobate waveguide technology. This IO technology is well established as reliable, rugged and field proven both in military and industrial applications. Hybrid microintegration of laser diodes and photodetectors with these components has been reported and is a viable option for use in the proposed sensor.[4,5] The technology for lithium niobate IO fabrication and packaging is well established at LLNL. Use of lithium niobate for the waveguide material, however, precludes the possibility of monolithic integration of the semiconductor laser diode source and semiconductor photodetectors onto a single common substrate. Monolithic component integration can have tremendous benefits for the proposed sensor in terms of absolute package size, reduced coupling losses, enhanced stability and mass production.

We propose to fabricate a fully monolithic integrated sensor detection system on a common GaAs substrate using AlGaAs/GaAs epitaxial growth technology.[6,7] (See Figure 5.) The Mach-Zehnder functionality will be achieved through the use of semiconductor optical amplifiers (SOAs) as optical phase shift elements and amplitude controllers.[8] The ability to utilize the same semiconductor layers for different functionality

dramatically simplifies the fabrication of the laser/MZI/detector chip. Dozens of devices may be simultaneously fabricated in a single production sequence on a 50 or 65mm wafer.

To produce the chip, a laser diode section is defined by forward biasing a (single-mode) waveguide section with parallel optical facets, an SOA is fabricated similarly but with low reflectivity facet interfaces and the photodetector is an unbiased or reverse biased waveguide absorber which generates a photocurrent. The waveguide sections are regrown after etching (photolithographically defined) with transparent, low loss material deposition. Two key fabrication technologies are essential to constructing the SOA MZI chip: chemical etching for definition of laser facets and the low-loss waveguide deposition process for the AlGaAs/GaAs material system. Final package size of a chip based on this technology would be on the order of 1mm x 5mm. We believe that LLNL is uniquely positioned to prototype the MZI sensor chip because the LLNL passive waveguide process on ALGaAs/GaAs is unique in the world and our etching technology is the state of the art. (see figures 6 and 7).

Recent breakthroughs in semiconductor diode laser technology, high efficiency diode laser fiber coupling (90%) and quasi-phasematched frequency conversion technologies make fabrication of a highly efficient, versatile all solid state UV microchip laser excitation source for the proposed IOCE module feasible. Microchip lasers are miniature, high performance solid state diode pumped lasers fabricated from 1-3mm^3 solid state laser "chips". (See Figure 8.) The laser resonator is formed by depositing cavity mirrors directly on the chip faces to form a monolithic cavity. The performance characteristics of these devices result from their inherently short cavity length and pump source induced thermal lensing properties that produce an auto-stabilized condition for efficient single transverse mode (TEM_{00}) operation in conjunction with the marginally flat /flat solid state optical resonator structure. Some of their characteristics include simple single frequency operation, tunability over the gain bandwidth without mode hopping, short pulse and high peak power capability and high speed frequency and amplitude modulation capability. Composite cavity lasers composed of laser "chips" and "chips" of nonlinear materials sandwiched together allow highly efficient frequency conversion of the solid state laser output. Optical design, fabrication and development of suitable fiber coupled UV micro-laser system for the chemical sensor module will be undertaken. Initially, commercially available micro-chip laser modules operating at their fundamental or second harmonic will be used to evaluate this technology and determine the optimal nonlinear frequency mixing scheme for UV generation via sum frequency mixing or third harmonic generation.

Lastly, microfabrication techniques will be used to construct the necessary miniaturized valves and flow capillaries required for the sample collection, pre-analysis processing and injection manifold. Recent advances in the adaptation of microfabrication techniques originally developed for the microelectronics industry have been increasingly adapted to build mechanical devices in the growing field of Micro-Electro-Mechanical Systems (MEMS). Advances in MEMS technology are rapidly increasing the feasibility of integrated microflow systems and micro-instrumentation. The ability to integrate smart microelectronics for instrument control and data analysis along with mechanical and optical components required for a given analytical technique will permit the user to interface with the instrument at a much higher functional level than with present instruments, which are composed of many separate modules that must be interfaced and operated by the user. LLNL has advanced capabilities and experience necessary to develop the proposed components and is already developing a variety of chemical analysis microinstruments with MEMS technology.

We propose to develop a miniaturized sample collection and precision injection system based on micro-valve technology for the capillary electrophoresis chemical analysis sensor module. LLNL and Redwood MicroSystems, Inc. (Menlo Park, CA) are presently working together to expand Redwood's Fluistor™ product line of micro-fabricated valves.

(see Figures 9 and 10) The devices are micro-fabricated in silicon and are based on Redwood's thermopneumatic actuation principle. The microactuator is among the few which provides both high force and displacement needed for valve applications. The actuator motion is precise enough that it can effectively control flows over six orders of magnitude. Efforts are currently focused on new generations of valves which are faster, chemically resistant, normally-closed, and compatible with liquids. Work is also underway to integrate micro-valve arrays with microflow channels, pressure and flow sensors to form high performance, microflow systems for pressure regulation and flow control. We plan to exploit these technological developments in the proposed IOCE chemical sensor module. An important decision for the first prototype is to determine whether to actuate the microvalves with an integrated microfabricated actuator or an external actuator. The integrated microvalve actuator would have size advantages and be more faithful to the "microinstrument" concept, but the external actuator would initially have lower development costs, shorter development times, and possible performance advantages. Consequently, we will develop the first prototypes with external valve actuation in order to demonstrate system performance and then add integrated actuation as we approach final subsystem integration in FY98. Size of the completed microvalve manifold package will be on the order 50x50x3mm. Future generations could be reduced in size to 25x25x3mm.

The proposed microvalve work will leverage the results of ongoing microinstrumentation projects in the LLNL MicroTechnology Center (MTC) such as: (1) microvalve development in a CRADA partnership with Redwood MicroSystems, the world's leader in microfabricated valve technology; (2) development of high-throughput, high resolution capillary gel electrophoresis instruments for DNA sequencing; (3) portable gas chromatography chemical analysis systems; (4) microfabricated chemical reactors for the polymerase chain reaction (PCR); (5) miniature flow cytometers for cell sorting; (6) microchannel coolers for high power laser diode arrays; and (7) microfabrication of precision capillaries by etching and bonding of glass and silicon wafers.

Research and Development Issues:

Issue 1. The planar chip CE technology must be optimized for field sensor applications. CE chip design parameters must be engineered to optimize separation performance and minimum size. The best choice of CE chip substrate material, capillary size, separation voltage, electrokinetic sample injection parameters, and the mechanical packaging of the buffer and sample reservoir feeds must be determined.

Issue 2 An IOCE module package suitable for field deployment that minimizes microphonics and thermal management problems must be designed. A microoptic packaging strategy and optical design for interfacing the planar CE chip, the microchip laser excitation source and the integrated optic detection system waveguides must be developed.

Issue 3 General feasibility of the monolithic single substrate SOA Mach-Zender interferometer concept must be demonstrated at a level of performance suitable for use in the IOCE sensor module. If this approach does not meet expectations, a microoptical packaging strategy for the lithium niobate waveguide devices will need to be developed and implemented.

Issue 5 A compact energy efficient , reliable UV microlaser excitation system suitable for field operation must be designed and demonstrated. An efficient, low power, nonlinear optical frequency conversion scheme based on either third harmonic generation or sum frequency mixing of the micochip laser output must be designed and optimized and packaged.

Issue 6. Design and engineering of an automatic sample collection and prefiltering system must be completed to accommodate true field samples

Issue 7. Size reduction and packaging of support electronics and system power supply must be addressed

Issue 8. The optimum detection format and operating parameters for field deployment must be determined for the IOCE module

During FY97 the following tasks will be performed:

Task 1 Baseline CE and IO micro-package engineering, integration and testing ($500K)

(1.0) detailed mechanical and optical system design
(1.1) microfabrication and evaluation of planar chip CE test components from high performance substrate materials
(1.2) thermo-mechanical characterization and integration of planar chip CE and discrete commercial lithium niobate IO components.
(1.3) preliminary characterization and demonstration of baseline system separation and detection capabilities using optimized CE chip substrates
(1.4) development of IOCE test platfom for sub-system test and evaluation

Task 2 Development and testing of compact , energy efficient , high beam quality UV microchip laser system and interface to IOCE sensor module ($250K)

Task 3 Evaluation and testing of the SOA MZI concept for sensor applications; build and test and characterize a hybrid SOA MZI using discrete components. ($350K)

3.1) Fiber pigtail and package existing LLNL laser diode and SOA chips with polarization maintaining fiber.
(3.2) Test individual components -- SOA gain and phase shift as a funtion of current, laser diode threshold and output power versus current, laser diode linewidth and laser diode susceptibility to optical feedback, polarization extinction ratios of fiber splitters.
(3.3) Configure LLNL laser diode , SOA, photodiode and fiber splitter components into the MZI configuration. Characterize contrast ratio, stability to temperature, vibration and optical feedback effects on MZI transmission.
(3.4) Test and evaluate discrete component prototype developed in task 4.3 in IOCE sensor test system to compare with lithium niobate IO technology.

Task 4 Preliminary design, development and testing of automated microvalve sampling and filtering system. ($380K)

(4.1) Discrete valve development:
Determine actuation mechanism and general approach
Design discrete valve and package (2 iterations)
Photomask layout (2 iterations)
Microfabricate valve chip (2 iterations)
Fabricate package (2 iterations)

Test discrete valves (2 iterations)

(4.2) Sample injection and processing manifold development:

Design injection manifold chip (2 iterations)
Design manifold package and interface (2 iterations)
Solve gas generation/bubble problem
Photomask layout (2 iterations)
Microfabricate manifold chip (2 iterations)
Fabricate packages and interfaces (2 iterations)
Test manifolds (2 iterations)

(4.3) Discrete copmonent integration and testing with IOCE system

FY97 CAPITAL $ JUSTIFICATION

commercial laser systems for prototype development and testing (customized diode laser and microchip laser systems)	30K
subsystem IO components	55K
micro-manipulation equipment	20K
support electronics and electronic test equipment	45K
Total:	$150K

FY97 SCHEDULED MILESTONES

NUMBER	DUE DATE	COMPLETION DATE
1	01 / 15 / 97	

Initial optical and mechanical design work complete. Specification and procurement of critical system components and fabrication contracts complete. Fiber pigtail packaging and fabrication of SOA test chips complete. Preliminary design discrete microvalve system complete

2.	06 / 1/ 97	

Fabrication and testing of CE hardware test chips and fixtures incorporating initial design ideas complete. Preliminary evaluation of microchip laser technology and preliminary frequency conversion experiments completed. Individual SOA component testing is complete. Microvalve manifold design is complete.

3.	08 / 01 / 97	

Phase I IOCE sensor test bed is assemlbed and performance characterized with commercial lithium niobate IO technology. LLNL SOA/MZI components are assembled and characterized. Feasibility of the SOA/MZI concept is determined. Microvalve manifolds are assembled and tested.

4.	10 / 01 / 96	

Demonstration of test module incorporating all critical design components.

FY97 SCHEDULED DELIVERABLES:

NUMBER	DUE DATE	COMPLETION DATE
1	01 / 20 / 97	

LLNL sends DOE/HQ Quarterly Report for October through December 1996

2	04 / 20 / 97	

LLNL sends DOE/HQ Quarterly Report for January through March 1997

3.	07 / 20 / 97	

LLNL sends DOE/HQ Quarterly Report for April through June 1997

4.	10 / 20 / 97	

LLNL sends DOE/HQ Quarterly Report for July through September 1997

5.	10/20/97	

LLNL sends DOE/HQ report on design and package engineering test data for IOCE sensor module

During FY98 the following tasks will be performed:

Task 1. Develop a monolithic, chip SOA MZI chemical sensor using active/passive waveguide integration technology. Test and deliver several prototype chips. ($650K)

2.1) Fabricate laser diode, SOA and photodiode sections using CAIBE etching of a single substrate. Test individual component performance.
2.2) Fabricate passive wavegiude sections and measure loss, split ratio and extinction ratio.
2.3) Fabricate 3 dB couplers using LLNL passive waveguide technology and characterize. Integrate a single passive waveguide section with active laser diode and/or SOA.
2.4) Fabricte monolithic SOA MZI chip. Connect to CE chip using fiber. Test performance.

Task 2. Implementation of final IOCE sensor module design. Optimize source laser design. Complete system engineering tests and mechanical design characterization of final sensor module. Integrate all sub-components into final package ($850K)

Task 3. Size reduction and packaging of support electronics and system power supply ($300K)

FY98 CAPITAL $ JUSTIFICATION

Final laser technology, IO components and custom compact low energy budget data collection and signal processing electronics ($50K)

FY98 SCHEDULED MILESTONES

NUMBER	DUE DATE	COMPLETION DATE
1	01 / 15 / 97	

Complete final system design and design modifications.

2.	05 / 10 / 97	

Fabrication and testing of prototype module incorporating design changes complete.

3.	06 / 01 / 97	

Assembly and testing of final hardware.

4.	07 / 01 /97	

Testing of sensor module under simulated field conditions complete. Operating specifications determined.

5.	10 / 01 / 97	

Demonstrations of selected systems for trace analysis complete

FY98 SCHEDULED DELIVERABLES:

NUMBER	DUE DATE	COMPLETION DATE
1	01 / 20 / 98	

LLNL sends DOE/HQ Quarterly Report for October through December 1997

2	04 / 20 / 98	

LLNL sends DOE/HQ Quarterly Report for January through March 1998

3.	07 / 20 / 98	

LLNL sends DOE/HQ Quarterly Report for April through June 1998

4.	10 / 20 / 98	

LLNL sends DOE/HQ Quarterly Report for July through September 1998

5.	10/20/98	

LLNL send DOE/HQ report on IOCE micro sensor module integration and testing

During FY99 the following tasks will be performed:

Task 1. Develop second generation SOA MZI package. Make prototypes. ($350K)

Task 2. Final modifications and optimization of IOCE sensor module package and integration of custom control microelectronics.($600K)

Task 3. Simulated field testing of completed chemical sensor module and trace analysis demonstrations. ($250K)

FY99 CAPITAL $ JUSTIFICATION

Final laser technology, IO components and custom compact low energy budget data collection and signal processing electronics ($50K)

FY99 SCHEDULED MILESTONES

NUMBER	DUE DATE	COMPLETION DATE
1. Task 1 complete	06 / 01 / 99	
2. Task 2 is completed.	08 / 01 /96	
3. Demonstrations and system characerization is complete.	10 / 01 / 96	

FY99 SCHEDULED DELIVERABLES:

NUMBER	DUE DATE	COMPLETION DATE
1 LLNL sends DOE/HQ Quarterly Report for October through December 1998	01 / 20 / 98	
2 LLNL sends DOE/HQ Quarterly Report for January through March 1999	04 / 20 / 99	
3. LLNL sends DOE/HQ Quarterly Report for April through June 1999	07 / 20 / 99	
4. LLNL sends DOE/HQ Quarterly Report for July through September 1999	10 / 20 / 99	
5. LLNL send DOE/HQ report on final IOCE micro sensor module design, performance characteristics and simulated field test results	10/20/99	

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7. T. Tanbun-Ek, P.F. Sciortino, A.M. Sergent, K.W. Wecht, P. Wisk, Y.K. Chen, C.G. Bethea, and S.K. Sputz, "DFB Lasers INtegrated with Mach-Zehnder Optical Modulator Fabricated by Selective Area Growth MOVPE Technique", IEEE Photon. Tech Let., 7, 1019-1021, (1995).
8. T.Durhuss, C. Joergensen, B. Mikkelson, K.E Stubkjaer, " Monolithic Integrated Mach-Zehnder Wavelength Converter: Conversion and Transmision Experiments at 5 Gbits/s", OFC '95 Technical Digest , TuO6 ,p 75-76, (1995)

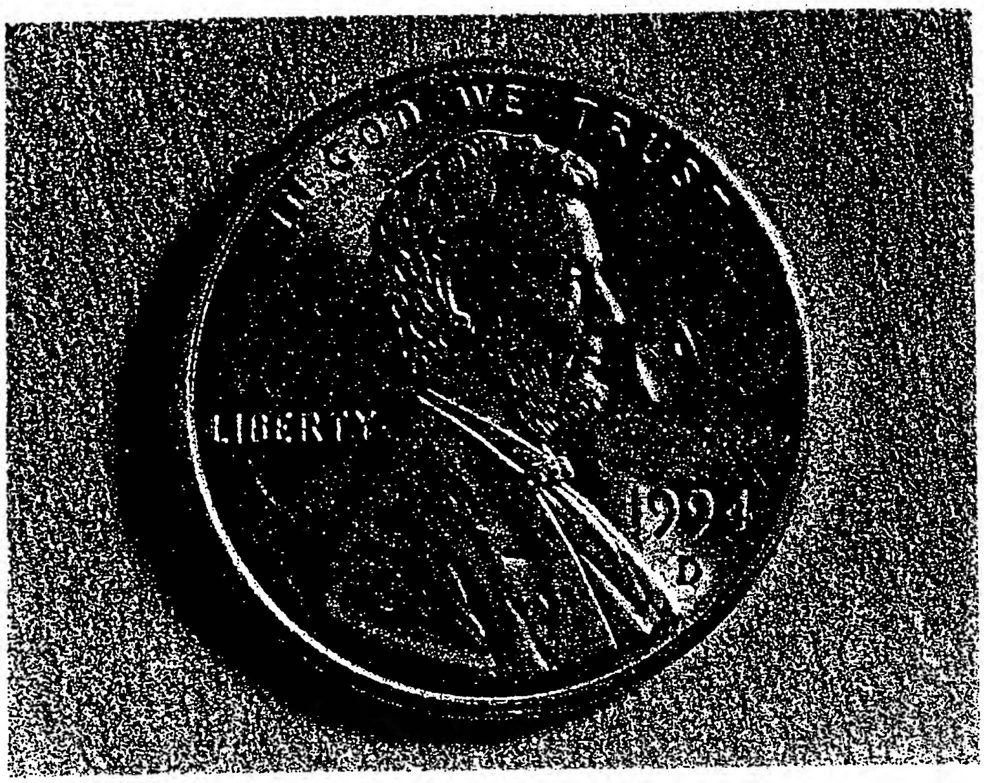

Figure 1. The microliter water sample shown above is one thousand times larger than the typical sample volume required for chemical analysis by capillary electrophoresis (CE).

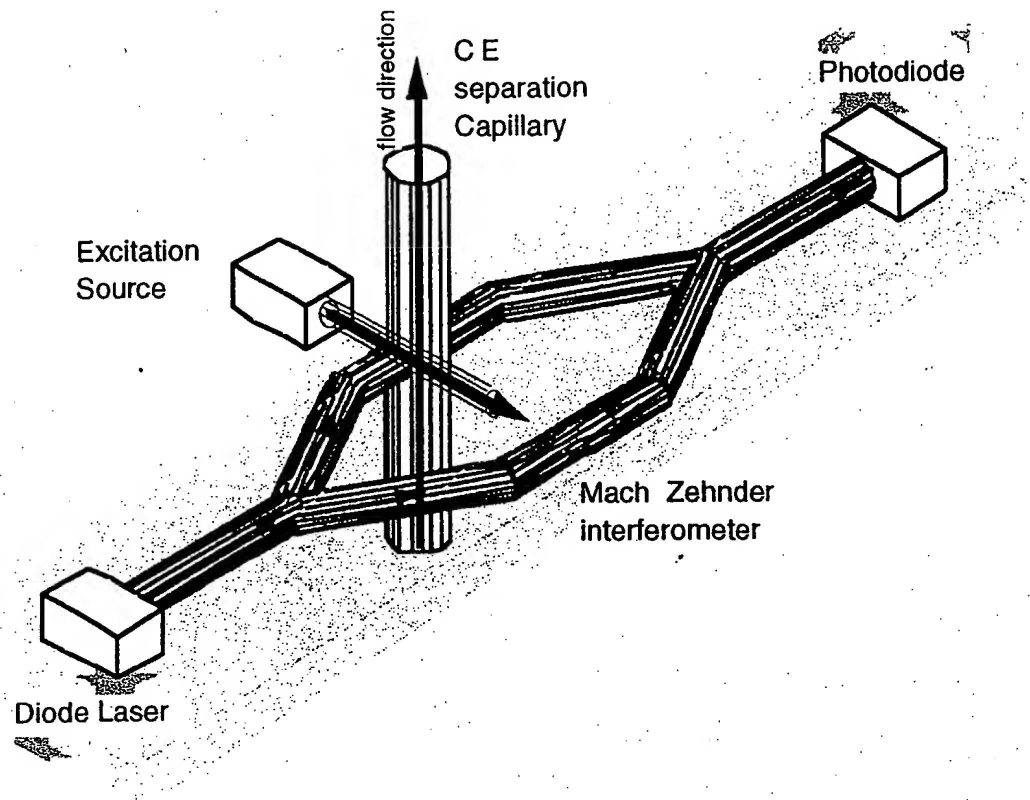

Figure 2. Conceptual diagram of the integrated optic capillary electrophoresis (IOCE) sensor module. Sample analytes are separated in the CE capillary by electrophoresis based on thier charge to mass ratio and detected by two beam interferometry. Use of a modulated excitation source increases the detection sensitivity by allowing photoinduced refractive index changes due to analyte absorption to be measured with a high signal to noise ratio.

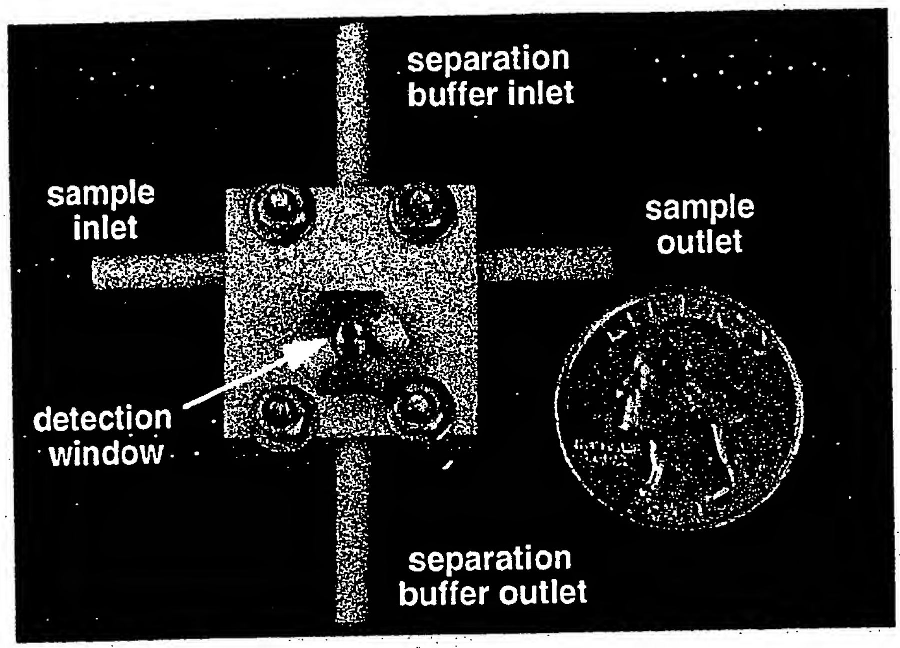

Figure 3: Ceramic planar chip CE system fabricated at LLNL for test and evaluation as part of our FY95 Advanced Concepts effort.

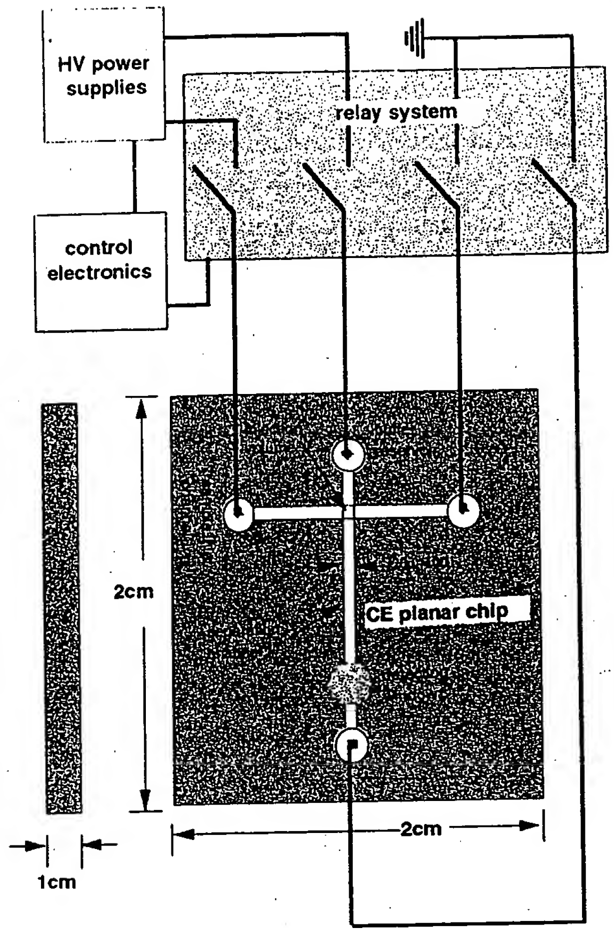

Figure 4: Schematic of capillary system micro-machined in the ceramic chip shown above. Samples are electro-kinetically injected into the separation capillary by applying a low voltage for a short period across the sample capillary. The sample is then electrophoretically separated by switching the voltage across the separation capillary.

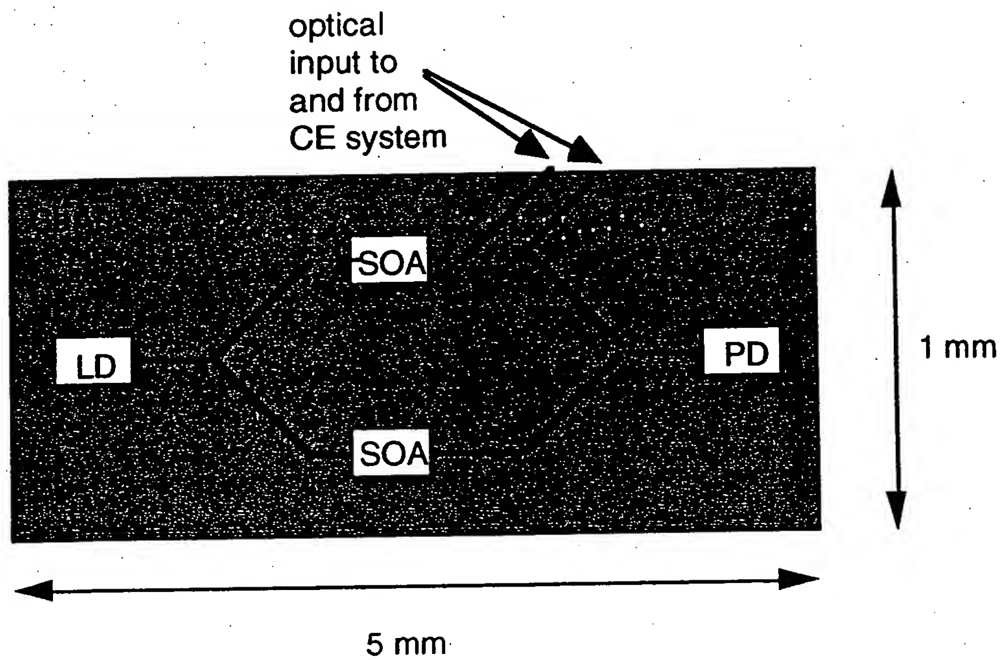

Figure 5. Schematic (not to scale) of a fully integrated Mach-Zehnder sensor using a semiconductor laser diode (LD) as the optical source, semiconductor optical amplifiers (SOAs) as optical phase shift/gain elements, passive single-mode waveguides to form the interferometer section and a semiconductor photodiode (PD) . This photonic circuit can be constructed using several existing LLNL proprietary fabrication technologies.

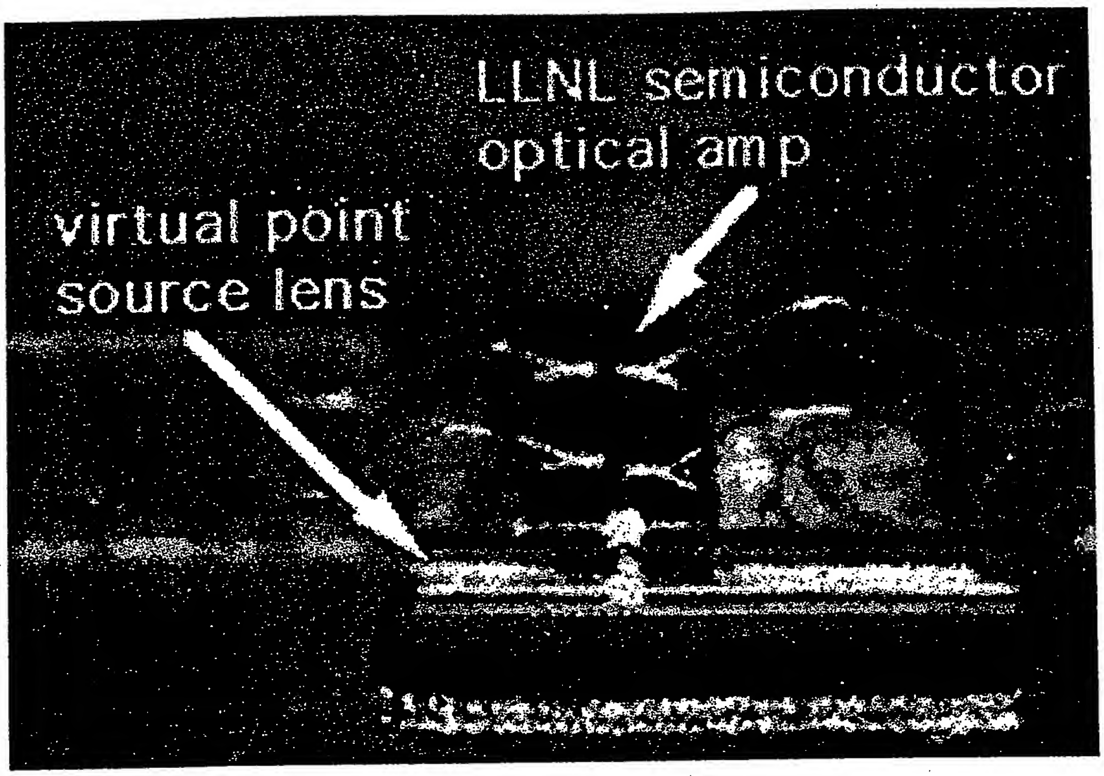

Figure 6. Example of semiconductor optical amplifiers (SOA's) fabricated and packaged at LLNL. We plan to leverage this technology in the proposed work.

Figure 7. Scanning electron micrograph (SEM) showing the deposition of a thick oxide layer on top of an InP-based ridge SOA. In FY96 we will employ this deposition process to integrate passive waveguide sections with active SOAs.

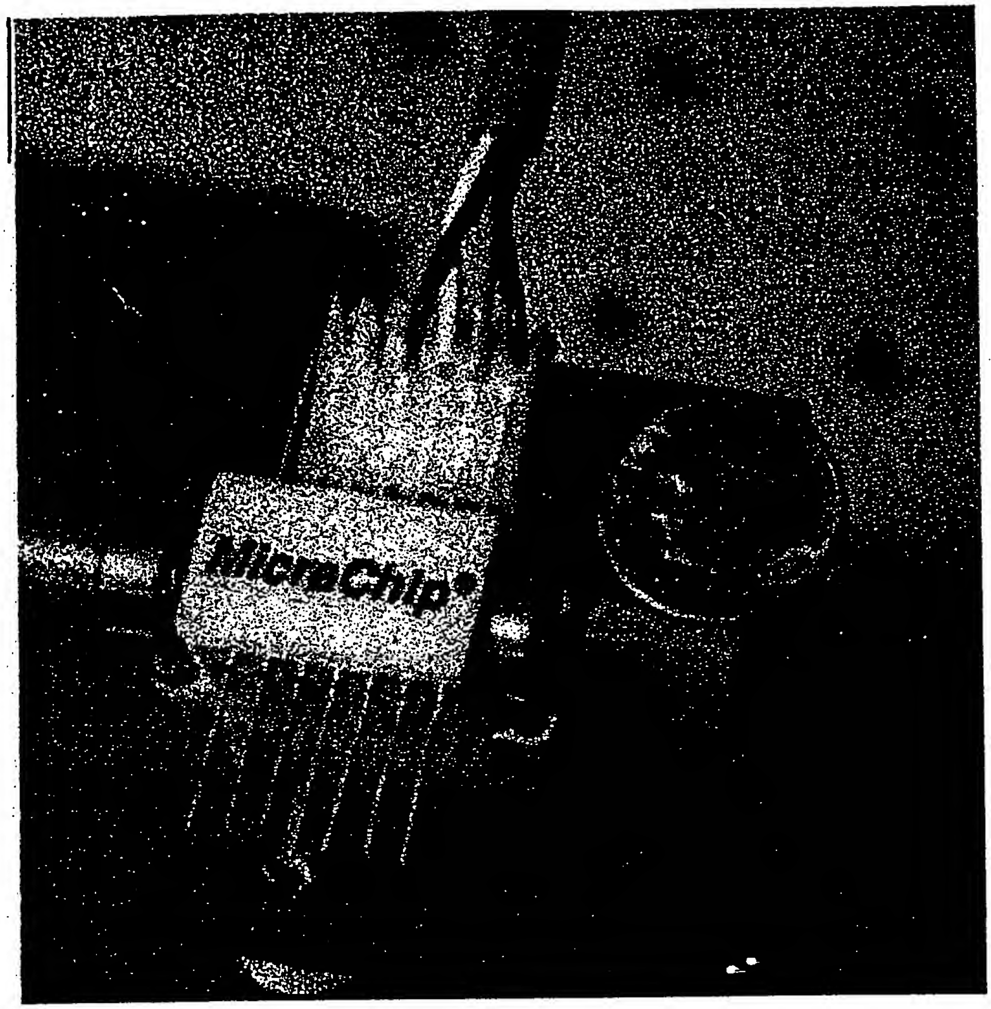

Figure 8. We plan to develop a UV excitation source suitable for the proposed IOCE sensor module based on an extention of diode pumped solid state microchip laser technology. An example of a frequency doubled commercial microchip laser is shown in the figure.

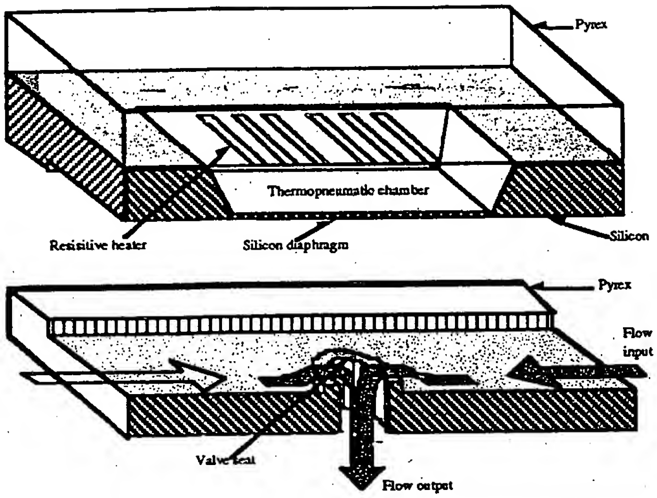

Figure 9. An exploded cross section of the thermopneumatically actuated microvalve. Heating the fluid within the chamber causes expansion, which bulges the diaphragm onto the valve seat, thereby closing the valve.

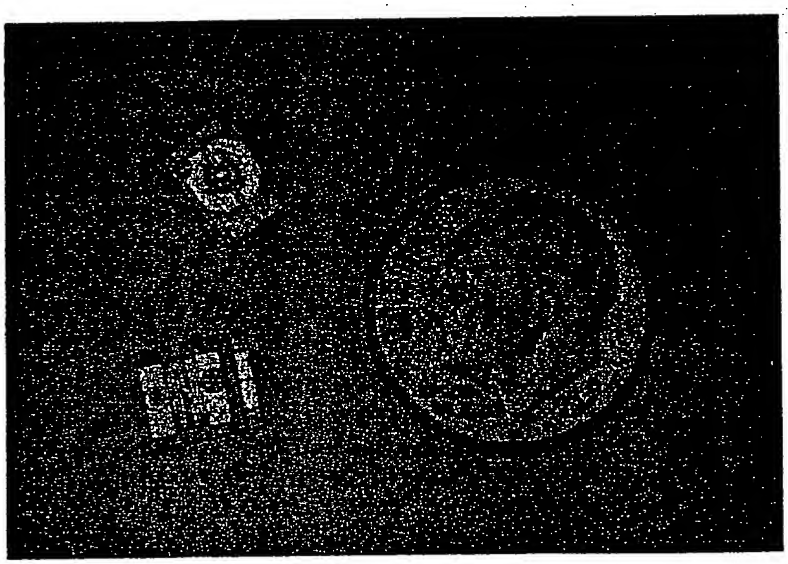

Figure 10. Redwood MicroSystems' microfabricated valve (Fluistor™). The valve measures 6x6x2mm.

Patent Priority List - Scoresheet

High 20 Date: June 1999

ATTACHMENT B

IL #: 9928 **Directorate:** NAI **Inventors:** Anthony J. Ruggiero

Title: Integrated Optical Capillary Electrophoresis Chemical Microsensor

Non-LLNL Inventors:

(Check all that apply) **High 20 Priority:** 1

XX	Recommended for the Top 20
	Important technical invention
XX	Commercial value
XXX	Significant Programmatic interest
	Important LLNL portfolio (e.g. Aerogels)
X	Proof of concept exists
	CRADA BIP
	CRADA Subject Invention
	License executed
	License in negotiation
XXX	Commercial interactions/marketing
	Other time factors (bar date, provisional)

Additional comments (Specialist/Program Rep)

Three companies interested in this technology.
Close to a reduction to practice.
This is the program's top-ranked case for patenting

Selected by IPAC for Top 20 (Weis/Dunipace) 6/23/99 (3)

Added to Top 20 List July 7, 1999

Bar Dates: **Search Completed** **Portfolio**

1 **Provisional filing date:** **Publication Date:** **Business Specialist:** Annemarie Meike

NEW IL's REPORT
NOVEMBER 2003

ATTACHMENT C

Directorate		IL Number Inventor/Title	Priority #	Review Comments	Review Action Items
NAI **Month** June 96 **No Interest by IPAC** **Account Nos.** 5382-50	**Program** Ted Scharlemann (sub for Arden) **Patents** Richard Main **IP&C** Lanier, West, Weis **BDE** Annemarie Meike ○ Requires Review Revisit ○ Requires Review Abeyance ○ Inactivate ○ No Interest ○ Priority 1 ○ Refer to DOE ◉ Waive & File ○ Waive	**9928** Anthony J. Ruggiero Integrated Optical Capillary Electrophoresis Chemical Microsensor **Rights Requested** 5/25/1999 **Rights Granted** 9/7/2000	1 **Revisits** June June99 **Provisional** **Filing Date** 6/8/2001 **Priority List** 7/7/99	•6/4/96: TS-Would like to go forward with this one. NN-20 is not currently funding this technology. VL-NN-20 is the sponsor. We need to find out how they feel about us licensing this technology. RM-It's patentable. A publication went out 3/20/96 to DOD for a conference. Think it's a wonderful disclosure--solid and well thought out. We need to take some action soon because of a possible bar date. BW-We ought to write it. •5/4/99: AD-There are three companies interested in this. Think the sponsor wants to commercialize. No publications. Real close to reduction to practice. •5/4/99: kb-Rights requested 7/23/96, though never granted. Linda Lerner will send 2nd request to DOE. •6/1/99: BW-Checked with Daubenspeck and haven't heard back. VL-Evidentally, DOE never did grant them. Mixup with paperwork. Resent paperwork and they will respond back. By the time we get ready to do Top 20, we should hear from DOE. Linda can give us an update. AD-Full prototype is to be complete within one year.	•6/4/96: TL-Check on sponsor's attitude towards licensing this technology and get back to Veronica. VL-Waive and file •5/4/99: BW-Check with Daubenspeck if rights haven't been granted. •6/1/99: Waive & File Waive and File

Top 20 Candidates

ATTACHMENT D
4/9/1996

IL#	Directorate	Title	Inventors	Specialist Name	Specialist	Disclosure Submitted	Provi:
9928	NAI	Integrated Optical Capillary Electrophoresis Chemical Microsensor	Anthony J. Ruggiero		Annemarie Meike	4/9/1996	

Priority 1

LLNL Patent Group - Patent Tracking

ATTACHMENT E

IL-	9928
IL Type	
Non-Lab Inventor	
Cont. App.	
Assignee	UC/IP&C
AIPA Applies	
RL-	13,534
S-	85,915
UC-	
Attorney	Scott
Date Attorney Assigned	6/1/2000
ROI Title	Integrated Optical Capillary Electrophoresis Chemical Microsensor
Inventors	Anthony J. Ruggiero
Non-LLNL Inventors	
Patent Status	First Office Action--resp. due 1/8/2003 (kr). Application mailed 6/8/2001. Application authorization by IP&C. Put On Patent Priority List On 7/7/99.
Patent App. Title	Chemical Micro-Sensor
Case Combined With	
Related Cases	
Attorney Comments	
IL Number	9928
Miscellaneous Information	
Account Nos.	5382-50
Directorate	NAI
BandR No.	GC0101093
No Interest by IPAC	
Inactivated by IPAC	
Inactivated by DOE	
Abandoned by	
Date Abandoned	
Disclosure Submitted	4/9/1996
Application Authorized	5/25/1999
Application Requester	IP&C
Rights Requested	5/25/1999
Type Requested	Identified Class
Rights Granted	9/7/2000
Confirmatory License	8/27/2001
Directorate Priority	1
Application Mailed	6/8/2001
Provisional Serial No.	
Provisional Filing Date	
Priority	
Additional Provisional Serial No./Filing Date	
	check priority date
Export Control	11/3/2003
Bar Date 1	
Serial No.	09/877961
Filing Date	6/8/2001
Bar Date 2	
Patent No.	
Issue Date	
	check priority date
Bar Date 3	
Publication Cite	
Publication Date	
EUVL	
EUVL Assignee	
Portfolio	

DUE DATES

IDS Due	
IDS Sent	6/8/2001
IL Number	9928

LLNL Patent Group - Patent Tracking

Restriction Req.		Restriction Req. Sent	
First Office Action	10/8/2003	First OA Sent	
Second Office Action		Second OA Sent	
Third Office Action		Third OA Sent	
Fourth Office Action		Fourth OA Sent	
Final Office Action		Final OA Sent	
Notice of Appeal Due		Notice of Appeal Sent (Check Response Due)	
Appeal Brief Due		Appeal Brief Sent	

CPA Filed				RCE filed			
1st CPA OA		1st CPA OA Sent		1st RCE OA		1st RCE OA Sent	
2ndCPA OA		2nd CPA OA Sent		2nd RCE OA		2nd RCE OA Sent	
Final CPA OA		Final CPA OA Sent		Final RCE OA		Final RCE OA Sent	

Notice of Allowance		Notice of Allowance Sent	
Notice of Allowability		Notice of Allowability Sent	
Response Due	1/8/2004	Multiple Due Dates ☐	FOA NOA

MAINTENANCE FEES

IL Number 9928

Three Yr Fee Due		Three Yr Fee Paid		Three Year Amount	
Seven Yr Fee Due		Seven Yr Fee Paid		Seven Year Amount	
Eleven Yr Fee Due		Eleven Yr Fee Paid		Eleven Year Amount	

Small Entity ☐ Yes ☐ No

IP&C INFORMATION

Licensee: ATL-0032-02, BAE Systems, 7/12/02, Option Agreement TL-1738-02, BAE Systems, 9/19/02, NE, FOU

Licensing Specialist: Annemarie Meike

Date Assigned

Search Requested		Search Completed		Search Sent To	
Last Modified Date	12/17/2003	Last Modified By:	Kathy	Last Modified Time	8:02:16 AM

Abstract

Patent Application | U.S. Patent

ATTACHMENT F

Account Nos.	5382-50
Additional Provisional Serial No. Filing Date	
Agents File Nos.	
Appeal Brief Due	
Appeal Brief Sent	
Applicant	Regents of the University of California
Application Authorized	5/25/1999
Application Mailed	6/8/2001
Application Requester	IP&C
Assignee	UC/IP&C
Attorney	Scott
Attorney Foreign	Scott
Attorney Comments	
BandR No.	GC0101093
Case Combined with	
Confirmatory License	8/27/2001
Cont. App.	
Countries	All PCT; National filing in; and Japan
Date Att. Assign.	6/1/2000
Directorate Priority	1
Disclosure Submitted	4/9/1996
Eleven Year Amount	
Eleven Yr Fee Due	
Eleven Yr Fee Paid	
Filing Date	6/8/2001
Final OA Sent	
Final Office Action	
First OA Sent	
First Office Action	10/8/2003
For. Response Due	
Foreign Agents	
Foreign Status	12/1/2003: L&P confirmed filing in EPO and JP(ns)
Foreign Title	Chemical Micro-Sensor
Fourth OA Sent	
Fourth Office Action	
IDS Due	9/6/2001
IDS Sent	6/8/2001
IL Index Key	9928
IL Number	9928
IL suffix	
IL Type	

IL Type	
Inactivated by DOE	
Inactivated by IPAC	
International Filing Date	5/31/2002
International Serial No.	PCT/US02/17125
Inventors	Anthony J. Ruggiero
IPAC PCT Req.	
Last Modified Date	12/17/2003
Last Person To Modify	Kathy Raymond
Last Modified Time	8:02:16 AM
Licensee	ATL-0032-02, BAE Systems, 7/12/02, Option Agreement
Miscellaneous Information	
Natl Appl. Nos.	
Notice of Allowability	
Notice of Allowability Sent	
Notice of Allowance Date	
Notice of Allowance Sent	
Notice of Appeal Due	
Notice of Appeal Sent	
Patent App. Title	Chemical Micro-Sensor
Patent Issued Date	
Patent Number	
Patent Status	First Office Action--resp. due 1/8/2003 (kr). Application
PCT Due	6/8/2002
PCT I National Entry	2/5/2003
PCT II Demand Due	1/5/2003
PCT II Demand Filed	7/23/2002
PCT II National Entry	12/6/2003
Priority Date	6/8/2001
Provisional Filing Date	
Provisional PCT Due	
Provisional Serial No.	
Publication Cite	
Publication Date	
Related Cases	
Response Due	1/8/2004
Restriction Req. Sent	
Restriction Requirement	
Rights Granted Date	9/7/2000
Rights Requested Date	5/25/1999
RL Number	13,534

ROI Title	Integrated Optical Capillary Electrophoresis Chemical
S Number	85,915
Second OA Sent	
Second Office Action	
Serial Number	09/877961
Seven Year Amount	
Seven Yr Fee Due	
Seven Yr Fee Paid	
Third OA Sent	
Third Office Action	
Three Year Amount	
Three Yr Fee Due	
Three Yr Fee Paid	
Type Requested	Identified Class Waiver W(C) 96-004
UC number	
Patent Expiration Date	
Foreign Patent No.	
Foreign Issue Date	
Prov. PCT Due Date	
Non-Lab Employee	
Modification Index	2003351.08021
No Interest by IPAC	
High 20 Nominated Candidate	6/23/99 (3)
High 20's List	7/7/1999
Omit	X
Priority	
Bar Date 1	
Foreign Bar Date	
Bar Date 2	
Bar Date 3	
Bar Date Comments	
Portfolio	
Abstract	
Int'l Search Report	3/13/2003
Written Opinion	
Response Sent	
Small Entity	
Int'l Pre Exam Rpt	
FOA NOA	
CPA Filed	
First CPA Office Action	

First CPA Office Action

Second CPA Office Action

Final CPA Office Action

First CPA OA Sent

Second CPA OA Sent

Final CPA OA Sent

EUVL

EUVL Assignee

Search Requested

Search Completed

Search Sent To

For. Miscellaneous Info

Prov PCT Request Sent

PCT Request Sent

Search Report Resp Sent

ISA

IPEA

Request to Outside Counsel

Supp Int'l Search Rpt Rec'd

Supp Search Rpt Resp

Int'l Pre Exam Resp

Written Opinion Resp

National Countries

National Fees

PCT Pub Date

PCT Pub Sent Inv.

AIPA Applies

Non LLNL Inventors

Multiple Due Dates

Multiple Foreign Due Dates

RCE filed

First RCE Office Action

First RCE Office Sent

Second RCE Office Action

Second RCE Office Sent

Final RCE Office Action

Final RCE Office Sent

Patent Application

U.S. Patent

Records of Invention

ATTACHMENT G

Business Sensitive, Treat As Proprietary Information

IL- 9928 **IL Type** **RL-** 13,534 **S-** 85,915 **UC-**

Title: Integrated Optical Capillary Electrophoresis Chemical Microsensor

Status: First Office Action--resp. due 1/8/2003 (kr). Application mailed 6/8/2001. Application authorization by IP&C. Put On Patent Priority List On 7/7/99.

Inventors: Anthony J. Ruggiero

Disclosure Submitted: 4/9/1996

Application Authorized: 5/25/1999

Publication Number / Date:

Portfolio:

Bar Date 1:

	Serial Number	Filing Date
Patent	09/877961	6/8/2001
Provisional		

Attorney: Scott

Patent Issued Date:

Directorate: NAI

High 20's List: 7/7/1999

Dir. Priority: 1

Licensing Specialist: Annemarie Meike

Related Cases:

Last Person To Modify: Kathy Raymond 12/17/2003 8:02:16 AM

Miscellaneous Information:

Modification Index 2003351.080216

Review Comments

•6/4/96: TS-Would like to go forward with this one. NN-20 is not currently funding this technology.
VL-NN-20 is the sponsor. We need to find out how they feel about us licensing this technology.
RM-It's patentable. A publication went out 3/20/96 to DOD for a conference. Think it's a wonderful disclosure--solid and well thought out. We need to take some action soon because of a possible bar date.
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•6/1/99: BW-Checked with Daubenspeck and haven't heard back.
VL-Evidentally, DOE never did grant them. Mixup with paperwork. Resent paperwork and they will respond back. By the time we get ready to do Top 20, we should hear from DOE. Linda can give us an update.
AD-Full prototype is to be complete within one year.

Review Action Items

•6/4/96: TL-Check on sponsor's attitude towards licensing this technology and get back to Veronica.
VL-Waive and file

•5/4/99: BW-Check with Daubenspeck if rights haven't been granted.
•6/1/99: Waive & File

Records of Invention

Business Sensitive, Treat As Proprietary Information

Abstract

DISCLOSURES, PATENT APPLICATIONS AUTHORIZED AND FILED

1/1/94 to 6/26/96

Directorate/ AD	Account No.	IL#	Title	Inventor	Assignee	Specialist	Disclosure Submitted	Application Authorized
	5382-50	9928	Integrated Optical Capillary Electrophoresis Chemical Microsensor	Anthony J. Ruggiero	UC/IP&C		4/9/1996	5/25/1999

*Disclosures assigned to DOE unless assignment requested by LLNL.
**UC/OTT Alameda is the Technology Transfer Office for The Regents

ATTACHMENT I

DIRECTORATE NOMINEE LIST
September 2003

IL#	Title	Inventors	Priority	Authorized	Bar Dates	Publication Date	Provisional Filing Date
9928	Integrated Optical Capillary Electrophoresis Chemical Microsensor	Anthony J. Ruggiero	1	5/25/1999			

Patent Priority List

7/7/1999

Directorate: NAI

NIF
ROI's Filed 7/1/02-6/30/03

IL#	Account Nos.	IL Type	Title	Inventors	Disclosure Date	Patent Filing Date	Patent Issued Date	Pa Nu
9928	5382-50		Integrated Optical Capillary Electrophoresis Chemical Microsensor	Anthony J. Ruggiero	4/9/1996	6/8/2001		

ATTACHMENT J

Cases Currently on the High 20

IL#	Title	Inventors	Added to List
9928	Integrated Optical Capillary Electrophoresis Chemical Microsensor	Anthony J. Ruggiero	7/7/1999

ATTACHMENT K

ATTACHMENT L

University of California
LAWRENCE LIVERMORE NATIONAL LABORATORY
Office of Patent Counsel

April ~~9~~ 10, 1996

Mr. William C. Daubenspeck
Office of Patent Counsel
U.S. Department of Energy
Livermore, California 94550

SUBJECT: Invention Case No.: IL-9928
"Integrated Optical Capillary Electrophoresis Chemical Microsensor"
By: Anthony J. Ruggiero

Dear Mr. Daubenspeck:

Enclosed is the original and one copy of the combined Disclosure and Record of Invention in the subject case.

Very truly yours,

Terry Contreras

Terry Contreras
Patent Group

Enclosure

cc: Howard B. Scheckman w/enc.
Jan Wallace w/enc.
Anthony J. Ruggiero L183 w/enc.